

FLOORS

780 CMR 3605.1 GENERAL

3605.1.1 Application: The provisions of 780 CMR 3605.0 shall control the design and construction of the floors for all buildings. The use of materials or methods of construction not specified in 780 CMR 3605.0 accomplishing the purposes intended by 780 CMR 36 and approved by the building official in accordance with 780 CMR 109 shall be accepted as complying with 780 CMR 36.

3605.1.2 Requirements: Floor construction shall be capable of *supporting* all loads imposed according to **780 CMR 3603.1** and transmitting the resulting loads to other supporting elements.

780 CMR 3605.2 FLOOR FRAMING

3605.2.1 General: Load-bearing dimension lumber for joists, beams and girders shall conform to DOC PS 20, *as listed in Appendix A*, and to other applicable standards or grading rules and shall be so identified by a grade mark or certificate of inspection issued by an approved agency. The grade mark or certificate shall provide adequate information to determine *F_b*, the allowable stress in bending, and *E*, the modulus of elasticity.

Exception: *Use of Native Lumber shall be allowed in accordance with 780 CMR 2303.0.*

3605.2.1.1 Preservative-treated lumber: Preservative-treated dimension lumber shall also be identified by the quality mark of an approved agency.

3605.2.1.2 Blocking and subflooring: Blocking shall be a minimum of Utility grade lumber. Subflooring may be a minimum of Utility Grade lumber or No. 4 Common grade boards.

3605.2.1.3 End jointed lumber: Approved end-jointed lumber may be used interchangeably with

solid-sawn members of the same species and grade.

3605.2.2 Design and construction: Floors of wood construction shall be designed and constructed in accordance with the provisions of 780 CMR 3605.2 and Figure **3605.2.2**.

3605.2.3 Allowable spans: Joists, girders and floor sheathing shall comply with **780 CMR 3605.2.3.1** through **3605.2.3.3** and **780 CMR 3605.3**.

3605.2.3.1 Allowable joist spans: The clear span of floor joists shall not exceed the values set forth in Tables **3605.2.3.1a**, **3605.2.3.1b** and **3605.2.3.1c**. The modulus of elasticity, *E*, and the actual stress in bending, *F_b*, shown in the tables shall not exceed the values specified in Tables **3605.2.3.1d** and **3605.2.3.1e** listed at the end of 780 CMR 3605.2. The values for *F_b*, specified as "repetitive member use" may be used when floor joists are spaced not more than 24 inches (610 mm) on center.

3605.2.3.2 Joists under bearing partitions: Joists under parallel bearing partitions shall be doubled or a beam of adequate size to support the load shall be provided. Double joists which are separated to permit the installation of piping or vents shall be *provided with* solid blocking spaced not more than four feet (1219 mm) on center.

3605.2.3.3 Allowable girder spans: The allowable spans of girders shall not exceed the values set forth in Tables **3605.2.3.3a** and **3605.2.3.3b**.

3605.2.4 Bearing: The ends of *all* joists, beams or girders shall have not less than 1½ inches (38 mm) of bearing on wood or metal and not less than three inches (76 mm) on masonry except where supported on a one-inch-by-four-inch (25 mm by 102 mm)

THE MASSACHUSETTS STATE BUILDING CODE

ribbon strip and nailed to the adjacent stud or *shall be supported by* the use of approved joist hangers.

3605.2.4.1 Floor systems: Joists *that are framed from opposite sides and extend over a* bearing support shall be tied together by lapping *the ends of each* joist a minimum of three inches (76 mm), or with a wood or metal splice *plate*, or *shall be secured by overlapping the floor sheathing at least three inches (76 mm) beyond the end of each floor joist*, or by other approved methods.

3605.2.4.2 Joist framing: Joists framing into the side of a wood girder shall be supported by approved framing anchors or on ledger strips

dimensions shall be supported laterally by solid blocking, diagonal bridging (wood or metal), or a continuous one-inch-by-three-inch (25 mm by 76 mm) strip *set perpendicularly* across the bottom of joists *and appropriately nailed*. *Bridging shall be installed* at intervals not exceeding *eight* feet (2438 mm).

Exception: Cantilevered joists shall be laterally braced at points of support.

3605.2.6 Cutting and notching: It shall be unlawful to notch, cut or pierce wood beams, joists, rafters or studs in excess of the limitations specified in 780 CMR 3605.2.6, unless proven safe by structural analysis or suitably reinforced to transmit all calculated loads.

3605.2.6.1 Drilling and notches: Notches in the top or bottom of joists shall not exceed one-sixth of the depth of the joist, *shall not be longer than one-third the depth of the member* and shall not be located in the middle third of the span. *Notch depth at the ends of the member* shall not exceed one-fourth the joist depth.

measuring not less than nominal two inches by two inches (51 mm by 51 mm).

3605.2.5 Lateral restraint at supports: Joists shall be supported laterally at the points of support by full-depth solid blocking not less than two inch (51 mm) *nominal* thickness; or by attachment to a header, band or rim joist, or to an adjoining stud; or shall be otherwise provided with lateral support to prevent rotation.

3605.2.5.1 Bridging: Joists having a depth-to-thickness ratio exceeding 6:1 based on nominal

Exceptions:

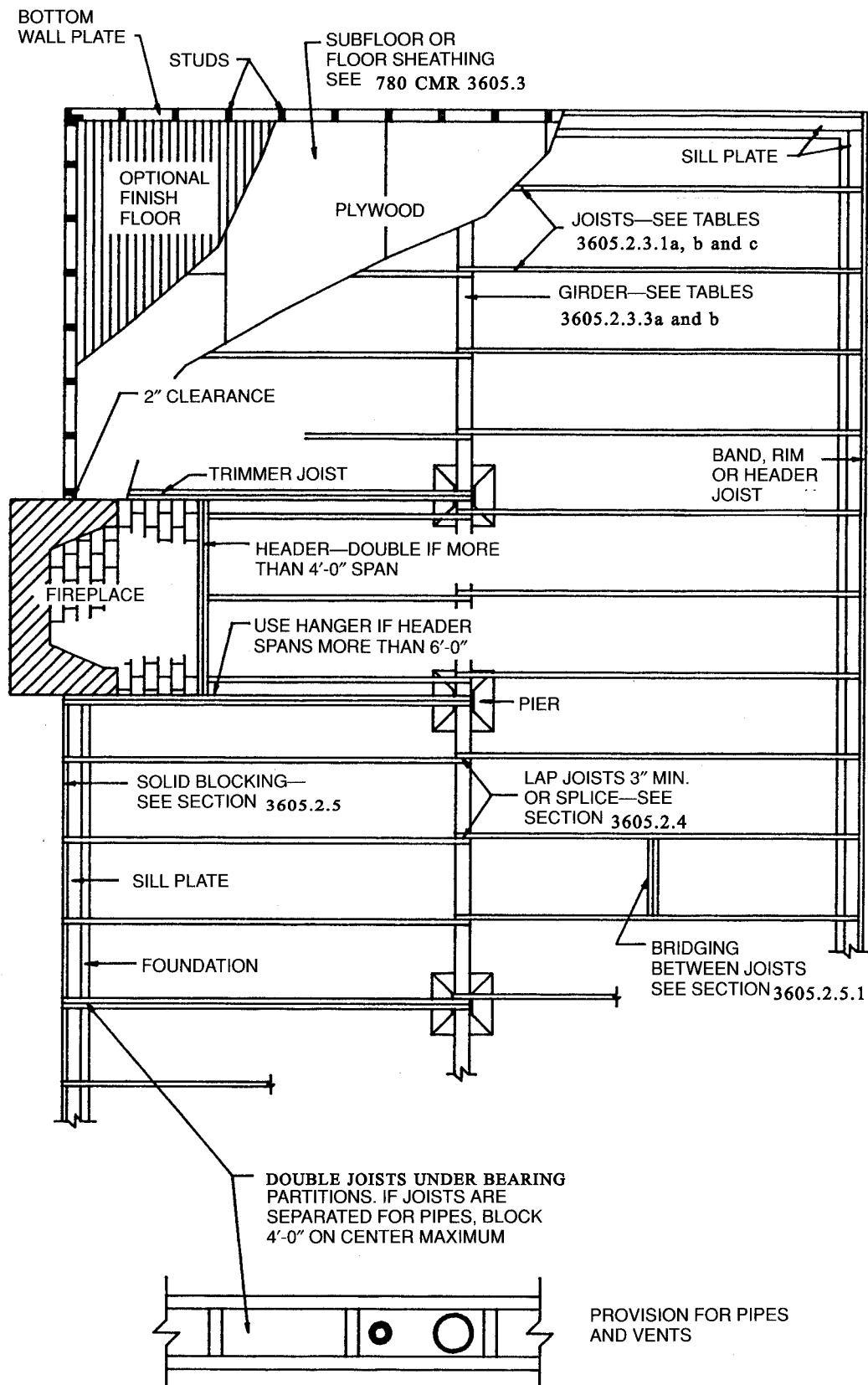
1. *A notch over the support is permitted to extend the full width of the support.*
2. *Notches on cantilevered portions of the member are permitted to extend the full length of the cantilever if the strength and deflection of the cantilever is calculated based on the reduced member section.*
3. *The tension side of beams, joists and rafters which are four inches or greater in nominal thickness, shall not be notched, except at ends of members.*

3605.2.7 Holes: Holes drilled, bored *or cut* into joists shall *not be closer than* two inches (51 mm) to the top or bottom of the joists, *or to any other hole located in the joist*. *Where the joist is notched, the hole shall not be closer than two inches to the notch*. *The diameter of the hole* shall not exceed one-third the depth of the joist.

3605.2.8 Fastening: Floor framing shall be nailed in accordance with Table 3606.2.3a. Where posts and beam or girder construction is used to support floor framing, positive connections shall be provided to ensure against uplift and lateral displacement.

FIGURE 3605.2.2
FLOOR CONSTRUCTION

ONE AND TWO FAMILY DWELLINGS - FLOORS



780 CMR: STATE BOARD OF BUILDING REGULATIONS AND STANDARDS
THE MASSACHUSETTS STATE BUILDING CODE

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

ONE AND TWO FAMILY DWELLINGS - FLOORS

TABLE 3605.2.3.1a
ALLOWABLE SPANS FOR FLOOR JOISTS
40 Lbs. per Sq. Ft. Live Load

(All rooms except those used for sleeping areas and attic floors.)

DESIGN CRITERIA:

Strength- Live load of 40 lbs. per sq. ft. plus dead load of 10 lbs. per sq. ft. determines the fiber stress value shown.

Deflection-For 40 lbs. per sq. ft. live load. Limited to span in inches divided by 360.

HOW TO USE TABLES: Enter table with span of joists (upper figure in each square). Determine size and spacing (first column) based on stress grade (lower figure in each square) and modulus of elasticity (top row) of lumber to be used.

Joist Size and Spacing		MODULUS OF ELASTICITY, “E,” IN 1,000,000 PSI																			
inches	inches	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0	2.2	2.4	
2 X 6	12.0	6-9	7-3	7-9	8-2	8-6	8-10	9-2	9-6	9-9	10-0	10-3	10-6	10-9	10-11	11-2	11-4	11-7	11-11	12-3	
		450	520	590	660	720	780	830	890	940	990	1,040	1,090	1,140	1,190	1,230	1,280	1,320	1,410	1,490	
	16.0	6-2	6-7	7-0	7-5	7-9	8-0	8-4	8-7	8-10	9-1	9-4	9-6	9-9	9-11	10-2	10-4	10-6	10-10	11-2	
		500	580	650	720	790	860	920	980	1,040	1,090	1,150	1,200	1,250	1,310	1,360	1,410	1,460	1,550	1,640	
	24.0	5-4	5-9	6-2	6-6	6-9	7-0	7-3	7-6	7-9	7-11	8-2	8-4	8-6	8-8	8-10	9-0	9-2	9-6	9-9	
		570	660	750	830	900	980	1,050	1,120	1,190	1,250	1,310	1,380	1,440	1,500	1,550	1,610	1,670	1,780	1,880	
	2 X 8	12.0	8-11	9-7	10-2	10-9	11-3	11-8	12-1	12-6	12-10	13-2	13-6	13-10	14-2	14-5	14-8	15-0	15-3	15-9	16-2
			450	520	590	660	720	780	830	890	940	990	1,040	1,090	1,140	1,190	1,230	1,280	1,320	1,410	1,490
		16.0	8-1	8-9	9-3	9-9	10-2	10-7	11-0	11-4	11-8	12-0	12-3	12-7	12-10	13-1	13-4	13-7	13-10	14-3	14-8
			500	580	650	720	790	850	920	980	1,040	1,090	1,150	1,200	1,250	1,310	1,360	1,410	1,460	1,550	1,640
24.0		7-1	7-7	8-1	8-6	8-11	9-3	9-7	9-11	10-2	10-6	10-9	11-0	11-3	11-5	11-8	11-11	12-1	12-6	12-10	
		570	660	750	830	900	980	1,050	1,120	1,190	1,250	1,310	1,380	1,440	1,500	1,550	1,610	1,670	1,780	1,880	
2 X 10		12.0	11-4	12-3	13-0	13-8	14-4	14-11	15-5	15-11	16-5	16-10	17-3	17-8	18-0	18-5	18-9	19-1	19-5	20-1	20-8
			450	520	590	660	720	780	830	890	940	990	1,040	1,090	1,140	1,190	1,230	1,280	1,320	1,410	1,490
		16.0	10-4	11-1	11-10	12-5	13-0	13-6	14-0	14-6	14-11	15-3	15-8	16-0	16-5	16-9	17-0	17-4	17-8	18-3	18-9
			500	580	650	720	790	850	920	980	1,040	1,090	1,150	1,200	1,250	1,310	1,360	1,410	1,460	1,550	1,640
	24.0	9-0	9-9	10-4	10-10	11-4	11-10	12-3	12-8	13-0	13-4	13-8	14-0	14-4	14-7	14-11	15-2	15-5	15-11	16-5	
		570	660	750	830	900	980	1,050	1,120	1,190	1,250	1,310	1,380	1,440	1,500	1,550	1,610	1,670	1,780	1,880	
	2 X 12	12.0	13-10	14-11	15-10	16-8	17-5	18-1	18-9	19-4	19-11	20-6	21-0	21-6	21-11	22-5	22-10	23-3	23-7	24-5	25-1
			450	520	590	660	720	780	830	890	940	990	1,040	1,090	1,140	1,190	1,230	1,280	1,320	1,410	1,490
		16.0	12-7	13-6	14-4	15-2	15-10	16-5	17-0	17-7	18-1	18-7	19-1	19-6	19-11	20-4	20-9	21-1	21-6	22-2	22-10
			500	580	650	720	790	860	920	980	1,040	1,090	1,150	1,200	1,250	1,310	1,360	1,410	1,460	1,550	1,640
24.0		11-10	11-10	12-7	13-3	13-10	14-4	14-11	15-4	15-10	16-3	16-8	17-0	17-5	17-9	18-1	18-5	18-9	19-4	19-11	

780 CMR: STATE BOARD OF BUILDING REGULATIONS AND STANDARDS

THE MASSACHUSETTS STATE BUILDING CODE

570	660	750	830	900	980	1,050	1,120	1,190	1,250	1,310	1,380	1,440	1,500	1,550	1,610	1,670	1,780	1,880
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For **SI**: 1 inch = 25.4 mm, 1 pound per square inch = 6.895 kPa, 1 pound per square foot = 0.0479 kN/m².

NOTE: The extreme fiber stress in bending, " F_b ," in pounds per square inch is shown below each span.

TABLE 3605.2.3.1b
ALLOWABLE SPANS FOR FLOOR JOISTS
30 Lbs per Sq. Ft. Live Load

(All rooms used for sleeping areas and attic floors.)

DESIGN CRITERIA:

Strength- 10 lbs. per sq. ft. dead load plus 30 lbs. per sq. live load determines fiber stress value shown.

Deflection-For 30 lbs. per sq. ft. live load. Limited to span in inches divided by 360.

HOW TO USE TABLES: Enter table with span of joists (Upper figure in each square). Determine size and spacing(first column) based on stress grade (lower figure in each square) and modulus of elasticity (top row) of lumber to be used.

Joist Size and Spacing		MODULUS OF ELASTICITY, "E," IN 1,000,000 PSI																		
inches	inches	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0	2.2	2.4
2 X 6	12.0	7-5	8-0	8-6	8-11	9-4	9-9	10-1	10-5	10-9	11-0	11-3	11-7	11-10	12-0	12-3	12-6	12-9	13-1	13-6
		440	510	570	640	700	750	810	860	910	960	1,010	1,060	1,100	1,150	1,200	1,240	1,280	1,370	1,450
	16.0	6-9	7-3	7-9	8-2	8-6	8-10	9-2	9-6	9-9	10-0	10-3	10-6	10-9	10-11	11-2	11-4	11-7	11-11	12-3
		480	560	630	700	770	830	890	950	1,000	1,060	1,110	1,160	1,220	1,270	1,320	1,360	1,410	1,500	1,590
	24.0	5-11	6-4	6-9	7-1	7-5	7-9	8-0	8-3	8-6	8-9	8-11	9-2	9-4	9-7	9-9	9-11	10-1	10-5	10-9
		550	640	720	800	880	950	1,020	1,080	1,150	1,210	1,270	1,330	1,390	1,450	1,510	1,560	1,620	1,720	1,820
	12.0	9-10	10-7	11-3	11-10	12-4	12-10	13-4	13-9	14-2	14-6	14-11	15-3	15-7	15-10	16-2	16-6	16-9	17-4	17-10
		440	510	570	640	700	750	810	860	910	960	1,010	1,060	1,100	1,150	1,200	1,240	1,280	1,370	1,450
	16.0	8-11	9-7	10-2	10-9	11-3	11-8	12-1	12-6	12-10	13-2	13-6	13-10	14-2	14-5	14-8	15-0	15-3	15-9	16-2
		480	560	630	700	770	830	890	950	1,000	1,060	1,110	1,160	1,220	1,270	1,320	1,360	1,410	1,500	1,590
2 X 8	24.0	7-9	8-5	8-11	9-4	9-10	10-2	10-7	10-11	11-3	11-6	11-10	12-1	12-4	12-7	12-10	13-1	13-4	13-9	14-2
		550	640	720	800	880	950	1,020	1,080	1,150	1,210	1,270	1,330	1,390	1,450	1,510	1,560	1,620	1,720	1,820
	12.0	12-6	13-6	14-4	15-1	15-9	16-5	17-0	17-6	18-0	18-6	19-0	19-5	19-10	20-3	20-8	21-0	21-5	22-1	22-9
		440	510	570	640	700	750	810	860	910	960	1,010	1,060	1,100	1,150	1,200	1,240	1,280	1,370	1,450
	16.0	11-4	12-3	13-0	13-8	14-4	14-11	15-5	15-11	16-5	16-10	17-3	17-8	18-0	18-5	18-9	19-1	19-5	20-1	20-8
		480	560	630	700	770	830	890	950	1,000	1,060	1,110	1,160	1,220	1,270	1,320	1,360	1,410	1,500	1,590
	24.0	9-11	10-8	11-4	11-11	12-6	13-0	13-6	13-11	14-4	14-8	15-1	15-5	15-9	16-1	16-5	16-8	17-0	17-6	18-0
		550	640	720	800	880	950	1,020	1,080	1,150	1,210	1,270	1,330	1,390	1,450	1,510	1,560	1,620	1,720	1,820
	12.0	15-2	16-5	17-5	18-4	19-2	19-11	20-8	21-4	21-11	22-6	23-1	23-7	24-2	24-8	25-1	25-7	26-0	26-10	27-8
		440	510	570	640	700	750	810	860	910	960	1,010	1,060	1,100	1,150	1,200	1,240	1,280	1,370	1,450
2 X 10	16.0	13-10	14-11	15-10	16-8	17-5	18-1	18-9	19-4	19-11	20-6	21-0	21-6	21-11	22-5	22-10	23-3	23-7	24-5	25-1
		480	560	630	700	770	830	890	950	1,000	1,060	1,110	1,160	1,220	1,270	1,320	1,360	1,410	1,500	1,590
	24.0	12-1	13-0	13-10	14-7	15-2	15-10	16-5	16-11	17-5	17-11	18-4	18-9	19-2	19-7	19-11	20-3	20-8	21-4	21-11
		550	640	720	800	880	950	1,020	1,080	1,150	1,210	1,270	1,330	1,390	1,450	1,510	1,560	1,620	1,720	1,820
2 X 12	12.0	15-2	16-5	17-5	18-4	19-2	19-11	20-8	21-4	21-11	22-6	23-1	23-7	24-2	24-8	25-1	25-7	26-0	26-10	27-8
		440	510	570	640	700	750	810	860	910	960	1,010	1,060	1,100	1,150	1,200	1,240	1,280	1,370	1,450
	16.0	13-10	14-11	15-10	16-8	17-5	18-1	18-9	19-4	19-11	20-6	21-0	21-6	21-11	22-5	22-10	23-3	23-7	24-5	25-1
		480	560	630	700	770	830	890	950	1,000	1,060	1,110	1,160	1,220	1,270	1,320	1,360	1,410	1,500	1,590
	24.0	12-1	13-0	13-10	14-7	15-2	15-10	16-5	16-11	17-5	17-11	18-4	18-9	19-2	19-7	19-11	20-3	20-8	21-4	21-11
		550	640	720	800	880	950	1,020	1,080	1,150	1,210	1,270	1,330	1,390	1,450	1,510	1,560	1,620	1,720	1,820

THE MASSACHUSETTS STATE BUILDING CODE

For **SI**: 1 inch = 25.4 mm, 1 pound per square inch = 6.895 kPa, 1 pound per square foot = 0.0479 kN/m².

NOTE: The extreme fiber stress in bending, " F_b ," in pounds per square inch is shown below each span.

TABLE 3605.2.3.1c
ALLOWABLE SPANS FOR FLOOR JOISTS IN DECKS AND BALCONIES
60 Lbs per square foot Live Load

DESIGN CRITERIA:

Strength - Live load of 60 psf plus dead load of 10 psf determines the fiber stress value shown.

Deflection - Live load of 60 psf. Limited to span (in inches) divided by 360.

HOW TO USE TABLES:

Enter table with span of joists (upper figure in each square). Determine size and spacing (first column) based on stress grade (lower figure in each square) and modulus of elasticity (top row) of lumber to be used.

Joist Size and Spacing inches		MODULUS OF ELASTICITY, “E”, IN 1,000,000 PSI																
		0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0	2.1	2.2	2.3	2.4
2x6	12	7-5	7-9	8-0	8-3	8-6	8-9	8-11	9-2	9-4	9-7	9-9	9-11	10-1	10-3	10-5	10-7	10-9
	16	767	830	890	949	1005	1061	1114	1167	1218	1268	1317	1366	1413	1460	1506	1551	1596
		6-9	7-0	7-3	7-6	7-9	7-11	8-2	8-4	8-6	8-8	8-10	9-0	9-2	9-4	9-6	9-7	9-9
		844	913	980	1044	1107	1167	1226	1284	1341	1396	1450	1503	1556	1607	1658	1707	1757
		5-11	6-2	6-4	6-7	6-9	6-11	7-1	7-3	7-5	7-7	7-9	7-10	8-0	8-2	8-3	8-5	8-6
		24	967	1046	1122	1195	1267	1336	1404	1470	1535	1598	1660	1721	1781	1848	1897	1995
2x8	12	9-10	10-2	10-7	10-11	11-3	11-6	11-10	12-1	12-4	12-7	12-10	13-1	13-4	13-6	13-9	13-11	14-2
	16	767	830	890	949	1005	1061	1114	1167	1218	1268	1317	1366	1413	1460	1506	1551	1596
		8-11	9-3	9-7	9-11	10-2	10-6	10-9	11-0	11-3	11-5	11-8	11-11	12-1	12-3	12-6	12-8	12-10
		844	913	980	1044	1107	1167	1226	1284	1341	1396	1450	1503	1556	1607	1658	1707	1757
		7-9	8-1	8-5	8-8	8-11	9-2	9-4	9-7	9-10	10-0	10-2	10-5	10-7	10-9	10-11	11-1	11-3
		24	967	1046	1122	1195	1267	1336	1404	1470	1535	1598	1660	1721	1781	1848	1897	1995
2x10	12	12-6	13-0	13-6	13-11	14-4	14-8	15-1	15-5	15-9	16-1	16-5	16-8	17-0	17-3	17-6	17-9	18-0
	16	767	830	890	949	1005	1061	1114	1167	1218	1268	1317	1366	1413	1460	1506	1551	1596
		11-4	11-10	12-3	12-8	13-0	13-4	13-8	14-0	14-4	14-7	14-11	15-2	15-5	15-8	15-11	16-2	16-5
		844	913	980	1044	1107	1167	1226	1284	1341	1396	1450	1503	1556	1607	1658	1707	1757
		9-11	10-4	10-8	11-0	11-4	11-8	11-11	12-3	12-6	12-9	13-0	13-3	13-6	13-8	13-11	14-1	14-4
		24	967	1046	1122	1195	1267	1336	1404	1470	1535	1598	1660	1721	1781	1848	1897	1995
2x12	12	15-2	15-10	16-5	16-11	17-5	17-11	18-4	18-9	19-2	19-7	19-11	20-3	20-8	21-0	21-4	21-7	21-11
	16	767	830	890	949	1005	1061	1114	1167	1218	1268	1317	1366	1413	1460	1506	1551	1596
		13-10	14-4	14-11	15-4	15-10	16-3	16-8	17-0	17-5	17-9	18-1	18-5	18-9	19-1	19-4	19-8	19-11
		844	913	980	1044	1107	1167	1226	1284	1341	1396	1450	1503	1556	1607	1658	1707	1757
		12-1	12-7	13-0	13-5	13-10	14-2	14-7	14-11	15-2	15-6	15-10	16-1	16-5	16-8	16-11	17-2	17-5
		24	967	1046	1122	1195	1267	1336	1404	1470	1535	1598	1660	1721	1781	1848	1897	1995

For **SI**: 1 inch = 25.4 mm, 1 pound per square inch = 6.895 kPa, 1 pound per square foot = 0.0479 kN/m².

780 CMR: STATE BOARD OF BUILDING REGULATIONS AND STANDARDS
THE MASSACHUSETTS STATE BUILDING CODE

NOTE: The extreme fiber stress in bending, " F_b ," in pounds per square inch is shown below each span.

TABLE 3605.2.3.1d
DESIGN VALUES FOR DIMENSION LUMBER - VISUAL GRADING

These " F_b " values are for use where three or more repetitive members are spaced not more than 24 inches apart. For wider spacing or for single or double member headers or beams, the " F_b " values should be reduced 13%. Values for surfaced dry or surfaced green lumber apply at 19% maximum moisture content in use.

SPECIES AND GRADE	SIZE	NORMAL DURATION	DESIGN VALUE IN BENDING “ <i>Fb</i> ”		MODULUS OF ELASTICITY “E”	GRADING RULES AGENCY		
			Snow Loading	7-Day Loading				
ASPEN								
Select Structural	2” x 4”	1,510	1,735	1,885	1,100,000			
No. 1		1,080	1,240	1,350	1,100,000			
No. 2		1,035	1,190	1,295	1,000,000			
No. 3		605	695	755	900,000			
Stud		600	690	750	900,000			
Construction		805	925	1,005	900,000			
Standard		430	495	540	900,000			
Utility	2” x 6”	200	230	250	800,000	Northeastern Lumber Manufacturers Association		
Select Structural		1,310	1,505	1,635	1,100,000			
No. 1		935	1,075	1,170	1,100,000			
No. 2		895	1,030	1,120	1,000,000			
No. 3		525	600	655	900,000			
Stud		545	630	685	900,000			
Select Structural		1,210	1,390	1,510	1,100,000			
No. 1	2” x 8”	865	990	1,080	1,100,000	Northern Softwood Lumber Bureau		
No. 2		830	950	1,035	1,000,000			
No. 3		485	555	605	900,000			
Select Structural		1,105	1,275	1,385	1,100,000			
No. 1		790	910	990	1,100,000			
No. 2		760	875	950	1,000,000			
No. 3		445	510	555	900,000			
Select Structural	2”x 10”	1,005	1,155	1,260	1,100,000	Western Wood Products Association		
No. 1		720	825	900	1,100,000			
No. 2		690	795	865	1,000,000			
No. 3		405	465	505	900,000		(See Footnotes 1 and 2)	
BEECH - BIRCH - HICKORY								
Select Structural		2” x 12”	2,500	2,875	3,125		1,700,000	Northeastern Lumber Manufacturers Association
No. 1			1,810	2,085	2,265		1,600,000	
No. 2	1,725		1,985	2,155	1,500,000			
No. 3	990		1,140	1,240	1,300,000			
Stud	980		1,125	1,225	1,300,000			
Construction	1,325		1,520	1,655	1,400,000	(See Footnotes 1 and 2)		
Standard	750		860	935	1,300,000			

THE MASSACHUSETTS STATE BUILDING CODE

SPECIES AND GRADE	SIZE	NORMAL DURATION	DESIGN VALUE IN BENDING “Fb”		MODULUS OF ELASTICITY “E”	GRADING RULES AGENCY
			Snow Loading	7-Day Loading		
Utility		345	395	430	1,200,000	
Select Structural		2,170	2,495	2,710	1,700,000	
No. 1		1,570	1,805	1,960	1,600,000	
No. 2		1,495	1,720	1,870	1,500,000	
No. 3		860	990	1,075	1,300,000	
Stud	2”x 6”	890	1,025	1,115	1,300,000	
Select Structural		2,000	2,300	2,500	1,700,000	
No. 1		1,450	1,665	1,810	1,600,000	
No. 2		1,380	1,585	1,725	1,500,000	
No. 3	2” x 8”	795	915	990	1,300,000	
Select Structural		1,835	2,110	2,295	1,700,000	
No. 1		1,330	1,525	1,660	1,600,000	
No. 2		1,265	1,455	1,580	1,500,000	
No. 3	2”x 10”	725	835	910	1,300,000	
Select Structural		1,670	1,920	2,085	1,700,000	
No. 1		1,210	1,390	1,510	1,600,000	
No. 2		1,150	1,325	1,440	1,500,000	
No. 3	2” x 12”	660	760	825	1,300,000	

TABLE 3605.2.3.1d - continued
DESIGN VALUES FOR DIMENSION LUMBER - VISUAL GRADING

SPECIES AND GRADE	SIZE	NORMAL DURATION	DESIGN VALUE IN BENDING “Fb”		MODULUS OF ELASTICITY “E”	GRADING RULES AGENCY
			Snow Loading	7-Day Loading		
COTTONWOOD						
Select Structural	2” x 4”	1,510	1,735	1,885	1,200,000	Northern Softwood Lumber Bureau (See Footnotes 1 and 2)
No. 1		1,080	1,240	1,350	1,200,000	
No. 2		1,080	1,240	1,350	1,100,000	
No. 3		605	695	755	1,100,000	
Stud		600	690	750	1,000,000	
Construction		805	925	1,005	1,000,000	
Standard	2” x 6”	460	530	575	900,000	
Utility		200	230	250	900,000	
Select Structural		1,310	1,505	1,635	1,200,000	
No. 1		935	1,075	1,170	1,200,000	
No. 2		935	1,075	1,170	1,100,000	
No. 3		525	600	655	1,000,000	
Stud	2” x 8”	545	630	685	1,000,000	
Select Structural		1,210	1,390	1,510	1,200,000	
No. 1		865	990	1,080	1,200,000	
No. 2		865	990	1,080	1,100,000	

THE MASSACHUSETTS STATE BUILDING CODE

TABLE 3605.2.3.1d - continued
DESIGN VALUES FOR DIMENSION LUMBER - VISUAL GRADING

SPECIES AND GRADE	SIZE	DESIGN VALUE IN BENDING " <i>F_b</i> "			MODULUS OF ELASTICITY " <i>E</i> "	GRADING RULES AGENCY
		NORMAL DURATION	Snow Loading	7-Day Loading		
No. 3		485	555	605	1,000,000	
Select Structural		1,105	1,275	1,385	1,200,000	
No. 1		790	910	910	1,200,000	
No. 2		790	910	990	1,100,000	
No. 3	2"x 10"	445	510	555	1,000,000	
Select Structural		1,005	1,155	1,260	1,200,000	
No. 1		720	825	900	1,200,000	
No. 2		720	825	900	1,100,000	
No. 3	2" x 12"	405	465	505	1,000,000	
DOUGLAS FIR - LARCH						
Select Structural		2,500	2,875	3,125	1,900,000	
No. 1 & Btr		1,985	2,280	2,480	1,800,000	
No. 1		1,725	1,985	2,155	1,700,000	
No. 2		1,510	1,735	1,885	1,600,000	
No. 3		865	990	1,080	1,400,000	
Stud		855	980	1,065	1,400,000	
Construction		1,150	1,325	1,440	1,500,000	
Standard		635	725	790	1,400,000	
Utility	2" x 4"	315	365	395	1,300,000	
Select Structural		2,170	2,495	2,710	1,900,000	West Coast Lumber Inspection Bureau
No. 1 & Btr		1,720	1,975	2,150	1,800,000	
No. 1		1,495	1,720	1,870	1,700,000	
No. 2		1,310	1,505	1,635	1,600,000	
No. 3		750	860	935	1,400,000	Western Wood Products Association
Stud	2"x 6"	775	895	970	1,400,000	
Select Structural		2,000	2,300	2,500	1,900,000	
No. & Btr		1,585	1,825	1,985	1,800,000	
No. 1		1,380	1,585	1,725	1,700,000	(See Footnotes 1 and 2)
No. 2		1,210	1,390	1,510	1,600,000	
No. 3	2" x 8"	690	795	865	1,400,000	
Select Structural		1,835	2,110	2,295	1,900,000	
No. 1 & Btr		1,455	1,675	1,820	1,800,000	
No. 1		1,265	1,455	1,580	1,700,000	
No. 2		1,105	1,275	1,385	1,600,000	
No. 3	2" x 10"	635	725	790	1,400,000	
Select Structural	2' x 12"	1,670	1,920	2,085	1,900,000	
No.1 & Btr		1,325	1,520	1,655	1,800,000	
No.1		1,150	1,325	1,440	1,700,000	

TABLE 3605.2.3.1d - continued
DESIGN VALUES FOR DIMENSION LUMBER - VISUAL GRADING

SPECIES AND GRADE	SIZE	DESIGN VALUE IN BENDING “Fb”			MODULUS OF ELASTICITY	GRADING RULES AGENCY
		NORMAL DURATION	Snow Loading	7-Day Loading	“E”	
No.2		1,005	1,155	1,260	1,600,000	National Lumber Grades Authority <

THE MASSACHUSETTS STATE BUILDING CODE

TABLE 3605.2.3.1d - continued
DESIGN VALUES FOR DIMENSION LUMBER - VISUAL GRADING

SPECIES AND GRADE	SIZE	DESIGN VALUE IN BENDING " <i>F_b</i> "			MODULUS OF ELASTICITY "E"	GRADING RULES AGENCY
		NORMAL DURATION	Snow Loading	7-Day Loading		
No. 3		710	815	890	1,100,000	
Stud		750	860	935	1,100,000	
Select Structural		1,795	2,065	2,245	1,400,000	
No. 1		1,240	1,430	1,555	1,300,000	
No. 2		1,140	1,310	1,425	1,200,000	
No. 3	2" x 8"	655	755	820	1,100,000	
Select Structural		1,645	1,890	2,055	1,400,000	
No. 1		1,140	1,310	1,425	1,300,000	
No. 2		1,045	1,200	1,305	1,200,000	
No. 3	2" x 10"	600	690	750	1,100,000	
Select Structural		1,495	1,720	1,870	1,400,000	
No. 1		1,035	1,190	1,295	1,300,000	
No. 2		950	1,090	1,185	1,200,000	
No. 3	2" x 12"	545	630	685	1,100,000	
EASTERN SOFTWOODS						
Select Structural		2,155	2,480	2,695	1,200,000	
No. 1		1,335	1,535	1,670	1,100,000	Northeastern Lumber Manufacturers Association
No. 2		990	1,140	1,240	1,100,000	
No. 3		605	695	755	900,000	
Stud		570	655	710	900,000	
Construction		775	895	970	1,000,000	Northern Softwood Lumber Bureau
Standard		430	495	540	900,000	
Utility	2" x 4"	200	230	250	800,000	
Select Structural		1,870	2,150	2,335	1,200,000	
No. 1		1,160	1,330	1,450	1,100,000	(See Footnotes 1 and 2)
No. 2		860	990	1,075	1,100,000	
No. 3	2"x 6"	525	600	655	900,000	
Stud		520	595	645	900,000	
Select Structural		1,725	1,985	2,155	1,200,000	
No. 1		1,070	1,230	1,335	1,100,000	
No. 2	2" x 8"	795	915	990	1,100,000	
No. 3		485	555	605	900,000	
Select Structural		1,580	1,820	1,975	1,200,000	
No. 1	2"x 10"	980	1,125	1,225	1,100,000	
No. 2		725	835	910	1,100,000	

TABLE 3605.2.3.1d - continued
DESIGN VALUES FOR DIMENSION LUMBER - VISUAL GRADING

SPECIES AND GRADE	SIZE	NORMAL DURATION	DESIGN VALUE IN BENDING " <i>F_b</i> "		MODULUS OF ELASTICITY " <i>E</i> "	GRADING RULES AGENCY
			Snow Loading	7-Day Loading		
No. 3		445	510	555	900,000	
Select Structural		1,440	1,655	1,795	1,200,000	
No. 1		890	1,025	1,115	1,100,000	
No. 2		660	760	825	1,100,000	
No. 3	2" x 12"	405	465	505	900,000	
EASTERN WHITE PINE						
Select Structural		2,155	2,480	2,695	1,200,000	
No. 1		1,335	1,535	1,670	1,100,000	
No. 2		990	1,140	1,240	1,100,000	
No. 3		605	695	755	900,000	
Stud		570	655	710	900,000	
Construction		775	895	970	1,000,000	
Standard		430	495	540	900,000	
Utility	2" x 4"	200	230	250	800,000	
Select Structural		1,870	2,150	2,335	1,200,000	
No. 1		1,160	1,330	1,450	1,100,000	
No. 2		860	990	1,075	1,100,000	
No. 3		525	600	655	900,000	
Stud	2" x 6"	520	595	645	900,000	
Select Structural		1,725	1,985	2,155	1,200,000	
No. 1		1,070	1,230	1,335	1,100,000	
No. 2		795	915	990	1,100,000	
No. 3	2" x 8"	485	555	605	900,000	Northeastern Lumber Manufacturers Association
Select Structural		1,580	1,820	1,975	1,200,000	
No. 1		980	1,125	1,225	1,100,000	
No. 2		725	835	910	1,100,000	
No. 3	2" x 10"	445	510	555	900,000	Northern Softwood Lumber Bureau
Select Structural		1,440	1,655	1,795	1,200,000	
No. 1		890	1,025	1,115	1,100,000	
No. 2		660	760	825	1,100,000	
No. 3	2" x 12"	405	465	505	900,000	(See Footnotes 1 and 2)
EASTERN HEMLOCK - TAMARACK						
Select Structural	2" x 4"	2,155	2,480	2,695	1,200,000	Northeastern Lumber Manufacturers Association
No. 1		1,335	1,535	1,670	1,100,000	
No. 2		990	1,140	1,240	1,100,000	

THE MASSACHUSETTS STATE BUILDING CODE

TABLE 3605.2.3.1d - continued
DESIGN VALUES FOR DIMENSION LUMBER - VISUAL GRADING

SPECIES AND GRADE	SIZE	NORMAL DURATION	DESIGN VALUE IN BENDING “Fb”		MODULUS OF ELASTICITY “E”	GRADING RULES AGENCY
			Snow Loading	7-Day Loading		
No. 3		605	695	755	900,000	Northern Softwood Lumber Bureau (See Footnotes 1 and 2)
Stud		570	655	710	900,000	
Construction		775	895	970	1,000,000	
Standard		430	495	540	900,000	
Utility		200	230	250	800,000	
Select Steuctural		1,870	2,150	2,335	1,200,000	
No. 1		1,160	1,330	1,450	1,100,000	
No. 2		860	990	1,075	1,100,000	
No. 3		525	600	655	900,000	
Stud	2" x 6"	520	595	645	900,000	
Select Structural		1,725	1,985	2,155	1,200,000	
No. 1		1,070	1,230	1,335	1,100,000	
No. 2		795	915	990	1,100,000	
No. 3	2" x 8"	485	555	605	900,000	
Select Structural		1,580	1,820	1,975	1,200,000	
No. 1		980	1,125	1,225	1,100,000	
No. 2		725	835	910	1,100,000	
No. 3	2" x 10"	445	510	555	900,000	
Select Structural		1,440	1,655	1795	1,200,000	
No. 1		890	1,025	1115	1,100,000	
No. 2		660	760	825	1,100,000	
No. 4	2" x 12"	405	465	505	900,000	
HEM - FIR						
Select Structural		2,415	2,775	3,020	1,600,000	West Coast Lumber Inspection Bureau
No. 1 & Btr		1,810	2,085	2,265	1,500,000	
No. 1		1,640	1,885	2,050	1,500,000	
No. 2	2” x 4”	1,465	1,685	1,835	1,300,000	
No. 3		865	990	1,080	1,200,000	
Stud		855	980	1,065	1,200,000	
Construction		1,120	1,290	1,400	1,300,000	
Standard		635	725	790	1,200,000	
Utility	2" x 4"	290	330	360	1,100,000	
Select Structural	2”x 6”	2,095	2,405	2,615	1,600,000	
No. 1 & Btr		1,570	1,805	1,960	1,500,000	Western Wood Products Association
No. 1		1,420	1,635	1,775	1,500,000	

TABLE 3605.2.3.1d - continued
DESIGN VALUES FOR DIMENSION LUMBER - VISUAL GRADING

SPECIES AND GRADE	SIZE	DESIGN VALUE IN BENDING “ <i>F_b</i> ”			MODULUS OF ELASTICITY	GRADING RULES AGENCY		
		NORMAL DURATION	Snow Loading	7-Day Loading	“E”			
No. 2		1,270	1,460	1,590	1,300,000	(See Footnotes 1 and 2)		
No. 3		750	860	935	1,200,000			
Stud		775	895	970	1,200,000			
Select Structural		1,930	2,220	2,415	1,600,000			
No. & Btr		1,450	1,665	1,810	1,500,000			
No. 1	2” x 8”	1,310	1,510	1,640	1,500,000			
No. 2		1,175	1,350	1,465	1,300,000			
No. 3		690	795	865	1,200,000			
Select Structural		1,770	2,035	2,215	1,600,000			
No. 1 & Btr		1,330	1,525	1,660	1,500,000			
No. 1	2” x 10”	1,200	1,380	1,500	1,500,000			
No. 2		1,075	1,235	1,345	1,300,000			
No. 3		635	725	790	1,200,000			
Select Structural		1,610	1,850	2,015	1,600,000			
No. 1 & Btr		1,210	1,390	1,510	1,500,000			
No. 1	2” x 12”	1,095	1,255	1,365	1,500,000			
No. 2		980	1,125	1,220	1,300,000			
No. 3		575	660	720	1,200,000			
HEM - FIR (NORTH)								
Select Structural		2” x 4”	2,245	2,580	2,805			1,700,000
No. 1/ No. 2	1,725		1,985	2,155	1,600,000			
No. 3	990		1,140	1,240	1,400,000			
Stud	980		1,125	1,225	1,400,000			
Construction	1,325		1,520	1,655	1,500,000			
Standard	2” x 6”	720	825	900	1,400,000		(See Footnotes 1 and 2)	
Utility		345	395	430	1,300,000			
Select Structural		1,945	2,235	2,430	1,700,000			
No. 1/ No. 2		1,495	1,720	1,870	1,600,000			
No. 3		860	990	1,075	1,400,000			
Stud	2” x 8”	890	1,025	1,115	1,400,000	(See Footnotes 1 and 2)		
Select Structural		1,795	2,065	2,245	1,700,000			
No. 1/ No. 2		1,380	1,585	1,725	1,600,000			
No. 3		795	915	990	1,400,000			
Select Structural		1,645	1,890	2,055	1,700,000			
No. 1/ No. 2	2” x 10”	1,265	1,455	1,580	1,600,000			

THE MASSACHUSETTS STATE BUILDING CODE

TABLE 3605.2.3.1d - continued
DESIGN VALUES FOR DIMENSION LUMBER - VISUAL GRADING

SPECIES AND GRADE	SIZE	NORMAL DURATION	DESIGN VALUE IN BENDING “Fb”		MODULUS OF ELASTICITY “E”	GRADING RULES AGENCY
			Snow Loading	7-Day Loading		
No. 3	2” x 12”	725	835	910	1,400,000	Northeastern Lumber Manufacturers Association (See Footnotes 1 and 2)
Select Structural		1,495	1,720	1,870	1,700,000	
No. 1/ No. 2		1,150	1,325	1,440	1,600,000	
No. 3		660	760	825	1,400,000	
MIXED MAPLE						
Select Structural	2” x 4”	1,725	1,985	2,155	1,300,000	
No. 1		1,250	1,440	1,565	1,200,000	
No. 2		1,210	1,390	1,510	1,100,000	
No. 3		690	795	865	1,000,000	
Stud		695	800	870	1,000,000	
Construction		920	1,060	1,150	1,100,000	
Standard		520	595	645	1,000,000	
Utility		260	300	325	900,000	
Select Structural	2” x 6”	1,495	1,720	1,870	1,300,000	
No. 1		1,085	1,245	1,355	1,200,000	
No. 2		1,045	1,205	1,310	1,100,000	
No. 3		600	690	750	1,000,000	
Stud		635	725	790	1,000,000	
Select Structural		1,380	1,585	1,725	1,300,000	
No. 1		1,000	1,150	1,250	1,200,000	
No. 2		965	1,110	1,210	1,100,000	
No. 3	2” x 8”	550	635	690	1,000,000	
Select Structural		1,265	1,455	1,580	1,300,000	
No. 1		915	1,055	1,145	1,200,000	
No. 2		885	1,020	1,105	1,100,000	
No. 3		505	580	635	1,000,000	
Select Structural		1,150	1,325	1,440	1,300,000	
No. 1		835	960	1,040	1,200,000	
No. 2		805	925	1,005	1,100,000	
No. 3	2” x 10”	460	530	575	1,000,000	
Select Structural		1,150	1,325	1,440	1,300,000	
No. 1		835	960	1,040	1,200,000	
No. 2		805	925	1,005	1,100,000	
No. 3		460	530	575	1,000,000	
Select Structural		1,150	1,325	1,440	1,300,000	
No. 1		835	960	1,040	1,200,000	
No. 2		805	925	1,005	1,100,000	
MIXED OAK						
Select Structural	2” x 4”	1,985	2,280	2,480	1,100,000	Northeastern Lumber Manufacturers Association
No. 1		1,425	1,635	1,780	1,000,000	
No. 2		1,380	1,585	1,725	900,000	
No. 3		820	940	1,025	800,000	

ONE AND TWO FAMILY DWELLINGS - FLOORS

TABLE 3605.2.3.1d - continued
DESIGN VALUES FOR DIMENSION LUMBER - VISUAL GRADING

SPECIES AND GRADE	SIZE	DESIGN VALUE IN BENDING “ <i>F_b</i> ”			MODULUS OF ELASTICITY	GRADING RULES AGENCY
		NORMAL DURATION	Snow Loading	7-Day Loading	“E”	
Stud		790	910	990	800,000	(See Footnotes 1 and 2)
Construction		1,065	1,225	1,330	900,000	
Standard		605	695	755	800,000	
Utility		290	330	360	800,000	
Select Structural		1,720	1,975	2,150	1,100,000	
No. 1		1,235	1,420	1,540	1,000,000	
No. 2		1,195	1,375	1,495	900,000	
No. 3		710	815	890	800,000	
Stud	2”x 6”	720	825	900	800,000	
Select Structural		1,585	1,825	1,985	1,100,000	
No. 1		1,140	1,310	1,425	1,000,000	
No. 2		1,105	1,270	1,380	900,000	
No. 3	2” x 8”	655	755	820	800,000	
Select Structural		1,455	1,675	1,820	1,100,000	
No. 1		1,045	1,200	1,305	1,000,000	
No. 2		1,010	1,165	1,265	900,000	
No. 3	2”x 10”	600	690	750	800,000	Northeastern Lumber Manufacturers Association
Select Structural		1,325	1,520	1,655	1,100,000	
No. 1		950	1,090	1,185	1,000,000	
No. 2		920	1,060	1,150	900,000	
No. 3	2” x 12”	545	630	685	800,000	(See Footnotes 1 and 2)
MIXED SOUTHERN PINE						
Select Structural		2,360	2,710	2,945	1,600,000	Southern Pine Manufacturers Association
No. 1		1,670	1,920	2,085	1,500,000	
No. 2		1,495	1,720	1,870	1,400,000	
No. 3		865	990	1,080	1,200,000	
Stud		890	1,025	1,115	1,200,000	(See Footnotes 1 and 2)
Construction		1,150	1,325	1,440	1,300,000	
Standard		635	725	790	1,200,000	
Utility		2” x 4”	315	365	395	
Select Structural		2,130	2,445	2,660	1,600,000	
No. 1		1,495	1,720	1,870	1,500,000	
No. 2		1,325	1,520	1,655	1,400,000	
No. 3		775	895	970	1,200,000	
Stud	2”x 6”	775	895	970	1,200,000	

THE MASSACHUSETTS STATE BUILDING CODE

TABLE 3605.2.3.1d - continued
DESIGN VALUES FOR DIMENSION LUMBER - VISUAL GRADING

SPECIES AND GRADE	SIZE	NORMAL DURATION	DESIGN VALUE IN BENDING “F _b ”		MODULUS OF ELASTICITY “E”	GRADING RULES AGENCY
			Snow Loading	7-Day Loading		
Select Structural		2,015	2,315	2,515	1,600,000	
No. 1		1,380	1,585	1,725	1,500,000	
No. 2		1,210	1,390	1,510	1,400,000	
No. 3	2” x 8”	720	825	900	1,200,000	
Select Structural		1,725	1,985	2,155	1,600,000	
No. 1		1,210	1,390	1,510	1,500,000	
No. 2		1,065	1,225	1,330	1,400,000	
No. 3	2”x 10”	605	695	755	1,200,000	
Select Structural		1,610	1,850	2,015	1,600,000	
No. 1		1,120	1,290	1,400	1,500,000	
No. 2		1,005	1,155	1,260	1,400,000	
No. 3	2” x 12”	575	660	720	1,200,000	
NORTHERN RED OAK						
Select Structural		2,415	2,775	3,020	1,400,000	
No. 1		1,725	1,985	2,155	1,400,000	
No. 2		1,680	1,935	2,100	1,300,000	
No. 3		950	1,090	1,185	1,200,000	
Stud		950	1,090	1,185	1,200,000	
Construction		1,265	1,455	1,580	1,200,000	
Standard		720	825	900	1,100,000	
Utility	2” x 4”	345	395	430	1,000,000	Northeastern Lumber Manufacturers Association
Select Structural		2,095	2,405	2,615	1,400,000	
No. 1		1,495	1,720	1,870	1,400,000	
No. 2		1,460	1,675	1,820	1,300,000	
No. 3		820	945	1,030	1,200,000	(See Footnotes 1 and 2)
Stud	2”x 6”	865	990	1,080	1,200,000	
Select Structural		1,930	2,220	2,415	1,400,000	
No. 1		1,380	1,585	1,725	1,400,000	
No. 2		1,345	1,545	1,680	1,300,000	
No. 3	2” x 8”	760	875	950	1,200,000	
Select Structural		1,770	2,035	2,215	1,400,000	
No. 1		1,265	1,455	1,580	1,400,000	
No. 2		1,235	1,420	1,540	1,300,000	
No. 3	2”x 10”	695	800	870	1,200,000	(See Footnotes 1 and 2)
Select Structural	2” x 12”	1,610	1,850	2,015	1,400,000	

TABLE 3605.2.3.1d - continued
DESIGN VALUES FOR DIMENSION LUMBER - VISUAL GRADING

SPECIES AND GRADE	SIZE	DESIGN VALUE IN BENDING " <i>F_b</i> "			MODULUS OF ELASTICITY " <i>E</i> "	GRADING RULES AGENCY
		NORMAL DURATION	Snow Loading	7-Day Loading		
No. 1		1,150	1,325	1,440	1,400,000	
No. 2		1,120	1,290	1,400	1,300,000	
No. 3		635	725	790	1,200,000	
NORTHERN SPECIES						
Select Structural		1,640	1,885	2,050	1,100,000	
No. 1/ No. 2		990	1,140	1,240	1,100,000	
No. 3		605	695	755	1,000,000	
Stud		570	655	710	1,000,000	
Construction		775	895	970	1,000,000	
Standard		430	495	540	900,000	
Utility	2" x 4"	200	230	250	900,000	
Select Structural		1,420	1,635	1,775	1,100,000	
No. 1/ No. 2		860	990	1,075	1,100,000	
No. 3		525	600	655	1,000,000	
Stud	2" x 6"	520	595	645	1,000,000	
Select Structural		1,310	1,510	1,640	1,100,000	
No. 1/ No. 2		795	915	990	1,100,000	
No. 3	2" x 8"	485	555	605	1,000,000	
Select Structural		1,200	1,380	1,500	1,100,000	
No. 1/ No. 2		725	835	910	1,100,000	
No. 3	2" x 10"	445	510	555	1,000,000	
Select Structural		1,095	1,255	1,365	1,100,000	
No. 1/ No. 2		660	760	825	1,100,000	(See Footnotes 1 and 2)
No. 3	2" x 12"	405	465	505	1,000,000	
NORTHERN WHITE CEDAR						
Select Structural		1,335	1,535	1,670	800,000	
No. 1		990	1,140	1,240	700,000	
No. 2		950	1,090	1,185	700,000	
No. 3		560	645	700	600,000	
Stud		540	620	670	600,000	
Construction		720	825	900	700,000	
Standard		405	465	505	600,000	
Utility	2" x 4"	200	230	250	600,000	
Select Structural	2" x 6"	1,160	1,330	1,450	800,000	
No. 1		860	990	1,075	700,000	

THE MASSACHUSETTS STATE BUILDING CODE

TABLE 3605.2.3.1d - continued
DESIGN VALUES FOR DIMENSION LUMBER - VISUAL GRADING

SPECIES AND GRADE	SIZE	DESIGN VALUE IN BENDING “ <i>F_b</i> ”			MODULUS OF ELASTICITY	GRADING RULES AGENCY
		NORMAL DURATION	Snow Loading	7-Day Loading	“E”	
No. 2		820	945	1,030	700,000	Northeastern Lumber Manufacturers Association (See Footnotes 1 and 2)
No. 3		485	560	605	600,000	
Stud		490	560	610	600,000	
Select Structural		1,070	1,230	1,335	800,000	
No. 1		795	915	990	700,000	
No. 2	2” x 8”	760	875	950	700,000	
No. 3		450	515	560	600,000	
Select Structural		980	1,125	1,225	800,000	
No. 1		725	835	910	700,000	
No. 2		695	800	870	700,000	
No. 3	2”x 10”	410	475	515	600,000	
Select Structural		890	1,025	1,115	800,000	
No. 1		660	760	825	700,000	
No. 2		635	725	790	700,000	
No. 3		375	430	465	800,000	
RED MAPLE						
Select Structural		2,245	2,580	2,805	1,700,000	Northeastern Lumber Manufacturers Association (See Footnotes 1 and 2)
No. 1		1,595	1,835	1,995	1,600,000	
No. 2		1,555	1,785	1,940	1,500,000	
No. 3		905	1,040	1,130	1,300,000	
Stud		885	1,020	1,105	1,300,000	
Construction	2” x 4”	1,210	1,390	1,510	1,400,000	
Standard		660	760	825	1,300,000	
Utility		315	365	395	1,200,000	
Select Structural		1,945	2,235	2,430	1,700,000	
No. 1		1,385	1,590	1,730	1,600,000	
No. 2	2”x 6”	1,345	1,545	1,680	1,500,000	
No. 3		785	905	980	1,300,000	
Stud		805	925	1,005	1,300,000	
Select Structural		1,795	2,065	2,245	1,700,000	
No. 1		1,275	1,470	1,595	1,600,000	
No. 2	2” x 8”	1,240	1,430	1,555	1,500,000	
No. 3		725	835	905	1,300,000	
Select Structural		2”x 10”	1,645	1,890	2,055	1,700,000
No. 1		1,170	1,345	1,465	1,600,000	

TABLE 3605.2.3.1d - continued
DESIGN VALUES FOR DIMENSION LUMBER - VISUAL GRADING

SPECIES AND GRADE	SIZE	DESIGN VALUE IN BENDING “ <i>Fb</i> ”			MODULUS OF ELASTICITY “E”	GRADING RULES AGENCY
		NORMAL DURATION	Snow Loading	7-Day Loading		
No. 2	2” x 12”	1,140	1,310	1,425	1,500,000	
No. 3		665	765	830	1,300,000	
Select Structural		1,495	1,720	1,870	1,700,000	
No. 1		1,065	1,225	1,330	1,600,000	
No. 2		1,035	1,150	1,295	1,500,000	
No. 3		605	695	755	1,300,000	
RED OAK						
Select Structural	2” x 4”	1,985	2,280	2,480	1,400,000	Northeastern Lumber Manufacturers Association
No. 1		1,425	1,635	1,780	1,300,000	
No. 2		1,380	1,585	1,725	1,200,000	
No. 3		820	940	1,025	1,100,000	
Stud		790	910	990	1,100,000	
Construction		1,065	1,225	1,330	1,200,000	
Standard	2” x 6”	605	695	755	1,100,000	(See Footnotes 1 and 2)
Utility		290	330	360	1,000,000	
Select Structural		1,720	1,975	2,150	1,400,000	
No. 1		1,235	1,420	1,540	1,300,000	
No. 2		1,195	1,375	1,495	1,200,000	
No. 3		710	815	890	1,100,000	
Stud	2” x 8”	720	825	900	1,100,000	
Select Structural		1,585	1,825	1,985	1,400,000	
No. 1		1,140	1,310	1,425	1,300,000	
No. 2		1,105	1,270	1,380	1,200,000	
No. 3		655	755	820	1,100,000	
Select Structural		1,455	1,675	1,820	1,400,000	
No. 1	2” x 10”	1,045	1,200	1,305	1,300,000	Northeastern Lumber Manufacturers Association
No. 2		1,010	1,165	1,265	1,200,000	
No. 3		600	690	750	1,100,000	
Select Structural		1,325	1,520	1,655	1,400,000	
No. 1		950	1,090	1,185	1,300,000	
No. 2		920	1,060	1,150	1,200,000	
No. 3	2” x 12”	545	630	685	1,100,000	(See Footnotes 1 and 2)
REDWOOD						
Clear Structural	2” x 4”	3,020	3,470	3,775	1,400,000	Redwood Inspection Service
Select Structural		2,330	2,680	2,910	1,400,000	
Select Structural, open		1,900	2,180	2,370	1,100,000	

THE MASSACHUSETTS STATE BUILDING CODE

TABLE 3605.2.3.1d - continued
DESIGN VALUES FOR DIMENSION LUMBER - VISUAL GRADING

SPECIES AND GRADE	SIZE	DESIGN VALUE IN BENDING " <i>F_b</i> "			MODULUS OF ELASTICITY "E"	GRADING RULES AGENCY
		NORMAL DURATION	Snow Loading	7-Day Loading		
grain						
No. 1		1,680	1,935	2,100	1,300,000	(See Footnotes 1 and 2)
No. 1, open grain		1,335	1,535	1,670	1,100,000	
No. 2		1,595	1,835	1,995	1,200,000	
No. 2, open grain		1,250	1,440	1,565	1,000,000	
No. 3		905	1,040	1,130	1,100,000	
No. 3, open grain		735	845	915	900,000	
Stud		725	835	910	900,000	
Construction		950	1,090	1,185	900,000	
Standard		520	595	645	900,000	
Utility		260	300	325	800,000	
Clear Structural		2,615	3,010	3,270	1,400,000	
Select Structural		2,020	2,320	2,525	1,400,000	
Select Structural, open grain		1,645	1,890	2,055	1,100,000	
No. 1		1,460	1,675	1,820	1,300,000	
No. 1, open grain		1,160	1,330	1,450	1,100,000	
No. 2		1,385	1,590	1,730	1,200,000	
No. 2, open grain		1,085	1,245	1,355	1,000,000	
No. 3		785	905	980	1,100,000	
No. 3, open grain		635	730	795	900,000	
Stud	2"x 6"	660	760	825	900,000	
Clear Structural		2,415	2,775	3,020	1,400,000	
Select Structural		1,865	2,140	2,330	1,400,000	
Select Structural, open grain		1,520	1,745	1,900	1,100,000	
No. 1		1,345	1,545	1,680	1,300,000	
No. 1, open grain		1,070	1,230	1,335	1,100,000	
No. 2	2" x 8"	1,275	1,470	1,595	1,203,000	
No. 2, open grain		1,000	1,150	1,250	1,000,000	Redwood Inspection Service
No. 3		725	835	905	1,100,000	
No. 3, open grain	2"x 8"	585	675	735	900,000	
Clear Structural	2"x 10"	2,215	2,545	2,765	1,400,000	
Select Structural		1,710	1,965	2,135	1,400,000	(See Footnotes 1 and 2)
Select Structural, open grain		1,390	1,600	1,740	1,100,000	
No. 1		1,235	1,420	1,540	1,300,000	
No. 1, open grain		980	1,125	1,225	1,100,000	

TABLE 3605.2.3.1d - continued
DESIGN VALUES FOR DIMENSION LUMBER - VISUAL GRADING

SPECIES AND GRADE	SIZE	DESIGN VALUE IN BENDING " <i>F_b</i> "			MODULUS OF ELASTICITY " <i>E</i> "	GRADING RULES AGENCY
		NORMAL DURATION	Snow Loading	7-Day Loading		
No. 2		1,170	1,345	1,465	1,200,000	
No. 2, open grain		915	1,055	1,145	1,000,000	
No. 3		665	765	830	1,100,000	
No. 3, open grain		540	620	670	900,000	
Clear Structural		2,015	2,315	2,515	1,400,000	
Select Structural		1,555	1,785	1,940	1,400,000	
Select Structural, open grain		1,265	1,455	1,580	1,100,000	
No. 1		1,120	1,290	1,400	1,300,000	
No. 1, open grain		890	1,025	1,115	1,100,000	
No. 2		1,065	1,225	1,330	1,200,000	
No. 2, open grain		835	960	1,040	1,000,000	
No. 3		605	695	755	1,100,000	
No. 3, open grain	2" x 12"	490	560	610	900,000	
SOUTHERN PINE						
Dense Select Structural		3,510	4,035	4,385	1,900,000	
Select Structural		3,280	3,770	4,095	1,800,000	
Non - Dense Select Structural		3,050	3,505	3,810	1,700,000	Southern Pine Inspection Bureau
No. 1 Dense		2,300	2,645	2,875	1,800,000	
No. 1		2,130	2,445	2,660	1,700,000	
No. 1 Non - Dense		1,955	2,250	2,445	1,600,000	(See Footnotes 1 and 2)
No. 2 Dense		1,955	2,250	2,445	1,700,000	
No. 2		1,725	1,985	2,155	1,600,000	
No. 2 Non - Dense		1,555	1,785	1,940	1,400,000	
No. 3		980	1,125	1,220	1,400,000	
Stud		1,005	1,155	1,260	1,400,000	
Construction		1,265	1,455	1,580	1,500,000	
Standard		720	825	900	1,300,000	
Utility	2" x 4"	345	395	430	1,300,000	
Dense Select Structural	2"x 6"	3,105	3,570	3,880	1,900,000	
Select Structural		2,935	3,370	3,665	1,800,000	
Non - Dense Select Structural		2,705	3,110	3,380	1,700,000	
No. 1 Dense		2,015	2,315	2,515	1,800,000	
No. 1		1,900	2,180	2,370	1,700,000	

THE MASSACHUSETTS STATE BUILDING CODE

TABLE 3605.2.3.1d - continued
DESIGN VALUES FOR DIMENSION LUMBER - VISUAL GRADING

SPECIES AND GRADE	SIZE	NORMAL DURATION	DESIGN VALUE IN BENDING “F _b ”		MODULUS OF ELASTICITY “E”	GRADING RULES AGENCY
			Snow Loading	7-Day Loading		
No. 1 Non - Dense		1,725	1,985	2,155	1,600,000	
No. 2 Dense		1,670	1,920	2,085	1,700,000	
No. 2		1,440	1,655	1,795	1,600,000	
No. 2 Non - Dense		1,325	1,520	1,655	1,400,000	
No. 3		865	990	1,080	1,400,000	Southern Pine Inspection Bureau
Stud	2" x 6"	890	1,025	1,115	1,400,000	
Dense Select Structural		2,820	3,240	3,520	1,900,000	
Select Structural		2,645	3,040	3,305	1,800,000	
Non - Dense Select Structural		2,415	2,775	3,020	1,700,000	(See Footnotes 1 and 2)
No. 1 Dense		1,900	2,180	2,370	1,800,000	
No. 1		1,725	1,985	2,155	1,700,000	
No. 1 Non - Dense		1,555	1,785	1,940	1,600,000	
No. 2 Dense		1,610	1,850	2,015	1,700,000	
No. 2		1,380	1,585	1,725	1,600,000	
No. 2 Non - Dense		1,265	1,455	1,580	1,400,000	
No. 3	2" x 8"	805	925	1,005	1,400,000	
Dense Select Structural		2,475	2,845	3,090	1,900,000	
Select Structural		2,360	2,710	2,945	1,800,000	
Non - Dense Select Structural		2,130	2,445	2,660	1,700,000	
No. 1 Dense		1,670	1,920	2,085	1,800,000	
No. 1		1,495	1,720	1,870	1,700,000	
No. 1 Non - Dense		1,380	1,585	1,725	1,600,000	
No. 2 Dense		1,380	1,585	1,725	1,700,000	
No. 2		1,210	1,390	1,510	1,600,000	
No. 2 Non - Dense		1,095	1,255	1,365	1,400,000	
No. 3	2" x 10"	690	795	865	1,400,000	
Dense Select Structural	2" x 12"	2,360	2,710	2,945	1,900,000	
Select Structural		2,185	2,515	2,730	1,800,000	
Non - Dense Select Structural		2,015	2,315	2,515	1,700,000	
No. 1 Dense		1,555	1,785	1,940	1,800,000	
No. 1		1,440	1,655	1,795	1,700,000	
No. 1 Non - Dense		1,325	1,520	1,655	1,600,000	
No. 2 Dense		1,325	1,520	1,655	1,700,000	

ONE AND TWO FAMILY DWELLINGS - FLOORS

TABLE 3605.2.3.1d - continued
DESIGN VALUES FOR DIMENSION LUMBER - VISUAL GRADING

SPECIES AND GRADE	SIZE	DESIGN VALUE IN BENDING “Fb”			MODULUS OF ELASTICITY	GRADING RULES AGENCY
		NORMAL DURATION	Snow Loading	7-Day Loading	“E”	
No. 2		1,120	1,290	1,400	1,600,000	
No. 2 Non - Dense		1,035	1,190	1,295	1,400,000	
No. 3		660	760	825	1,400,000	
SPRUCE - PINE - FIR						
Select Structural		2,155	2,480	2,695	1,500,000	
No. 1/ No. 2		1,510	1,735	1,885	1,400,000	
No. 3		865	990	1,080	1,200,000	
Stud		855	980	1,065	1,200,000	
Construction		1,120	1,290	1,400	1,300,000	National Lumber
Standard		635	725	790	1,200,000	Grades
Utility	2” x 4”	290	330	360	1,100,000	Authority
Select Structural		1,870	2,150	2,335	1,500,000	
No. 1/ No. 2		1,310	1,505	1,635	1,400,000	(See Footnotes 1 and 2)
No. 3		750	860	935	1,200,000	
Stud	2”x 6”	775	895	970	1,200,000	
Select Structural		1,725	1,985	2,155	1,500,000	
No. 1/ No. 2		1,210	1,390	1,510	1,400,000	
No. 3	2” x 8”	690	795	865	1,200,000	
Select Structural		1,580	1,820	1,975	1,500,000	National Lumber
No. 1/ No. 2		1,105	1,275	1,385	1,400,000	Grades
No. 3	2”x 10”	635	725	790	1,200,000	Authority
Select Structural		1,440	1,655	1,795	1,500,000	
No. 1/ No. 2		1,005	1,155	1,260	1,400,000	(See Footnotes 1 and 2)
No. 3		575	660	720	1,200,000	
No 3. open grain	2” x 12”	540	620	670	900,000	
SPRUCE - PINE - FIR (SOUTH)						
Select Structural		2,245	2,580	2,805	1,300,000	Northeastern
No. 1		1,465	1,685	1,835	1,200,000	Lumber
No. 2		1,295	1,490	1,615	1,100,000	Manufacturers
No. 3		735	845	915	1,000,000	Association
Stud		725	835	910	1,000,000	
Construction		980	1,125	1,220	1,000,000	Northern
Standard		545	630	685	900,000	Softwood
Utility	2” x 4”	260	300	335	900,000	Lumber
Select Structural	2”x 6”	1,945	2,235	2,430	1,300,000	Bureau
						West Coast Lumber

THE MASSACHUSETTS STATE BUILDING CODE

TABLE 3605.2.3.1d - continued
DESIGN VALUES FOR DIMENSION LUMBER - VISUAL GRADING

SPECIES AND GRADE	SIZE	DESIGN VALUE IN BENDING “Fb”			MODULUS OF ELASTICITY	GRADING RULES AGENCY
		NORMAL DURATION	Snow Loading	7-Day Loading	“E”	
No. 1		1,270	1,460	1,590	1,200,000	Inspection Bureau
No. 2		1,120	1,290	1,400	1,100,000	
No. 3		635	730	795	1,000,000	
Stud		660	760	825	1,000,000	
Select Structural		1,795	2,065	2,245	1,300,000	
No. 1	2” x 8”	1,175	1,350	1,465	1,200,000	(See Footnotes 1 and 2)
No. 2		1,035	1,190	1,295	1,100,000	
No. 3		585	675	735	1,000,000	
Select Structural		1,645	1,890	2,055	1,300,000	
No. 1		1,075	1,235	1,345	1,200,000	
No. 2	2”x 10”	950	1,090	1,185	1,100,000	
No. 3		540	620	670	1,000,000	
Select Structural		1,495	1,720	1,870	1,300,000	
No. 1		980	1,125	1,220	1,200,000	
No. 2		865	990	1,080	1,100,000	
No. 3	2” x 12”	490	560	610	1,000,000	
WESTERN CEDARS						
Select Structural		1,725	1,985	2,155	1,100,000	West Coast Lumber Inspection Bureau
No. 1		1,250	1,440	1,565	1,000,000	
No. 2		1,210	1,390	1,510	1,000,000	
No. 3		690	795	865	900,000	
Stud		695	800	870	900,000	
Construction	2” x 4”	920	1,060	1,150	900,000	Western Woods Products Association
Standard		520	595	645	800,000	
Utility		260	300	325	800,000	
Select Structural		1,495	1,720	1,870	1,100,000	
No. 1		2”x 6”	1,085	1,245	1,355	
No. 2	2" x 6"	1,045	1,205	1,310	1,000,000	West Coast Lumber Inspection Bureau
No. 3		600	690	750	900,000	
Stud		635	725	790	900,000	
Select Structural		1,380	1,585	1,725	1,100,000	
No. 1		1,000	1,150	1,250	1,000,000	
No. 2	2” x 8”	965	1,110	1,210	1,000,000	Western Woods Products Association
No. 3		550	635	690	900,000	
Select Structural		2”x 10”	1,265	1,455	1,580	
(See Footnotes						

TABLE 3605.2.3.1d - continued
DESIGN VALUES FOR DIMENSION LUMBER - VISUAL GRADING

SPECIES AND GRADE	SIZE	NORMAL DURATION	DESIGN VALUE IN BENDING “Fb”		MODULUS OF ELASTICITY “E”	GRADING RULES AGENCY
			Snow Loading	7-Day Loading		
No. 1	2” x 12”	915	1,055	1,145	1,000,000	1 and 2)
No. 2		885	1,020	1,105	1,000,000	
No. 3		505	580	635	900,000	
Select Structural		1,150	1,325	1,440	1,100,000	
No. 1		835	960	1,040	1,000,000	
No. 2		805	925	1,005	1,000,000	
No. 3		460	530	575	900,000	
WESTERN WOODS						
Select Structural	2” x 4”	1,150	1,735	1,885	1,200,000	West Coast Lumber Inspection Bureau
No. 1		1,120	1,290	1,400	1,100,000	
No. 2		1,120	1,290	1,400	1,000,000	
No. 3		645	745	810	900,000	
Stud		635	725	790	900,000	
Construction		835	960	1,040	1,000,000	
Standard		460	530	575	900,000	
Utility		230	265	290	800,000	
Select Structural	2” x 6”	1,310	1,505	1,635	1,200,000	
No. 1		970	1,120	1,215	1,100,000	
No. 2		970	1,120	1,215	1,000,000	
No. 3		560	645	700	900,000	
Stud		575	660	720	900,000	
Select Structural		1,210	1,390	1,510	1,200,000	
No. 1		895	1,030	1,120	1,100,000	
No. 2	2” x 8”	895	1,030	1,120	1,000,000	
No. 3		520	595	645	900,000	
Select Structural		1,105	1,275	1,385	1,200,000	
No. 1		820	945	1,030	1,100,000	
No. 2		820	945	1,030	1,000,000	
No. 3		475	545	595	900,000	
Select Structural		1,005	1,155	1,260	1,200,000	
No. 1	2” x 10”	750	860	935	1,100,000	
No. 2		750	860	935	1,000,000	
No. 3		430	495	540	900,000	
WHITE OAK						
Select Structural		2” x 4”	2,070	2,380	2,590	1,100,000

780 CMR: STATE BOARD OF BUILDING REGULATIONS AND STANDARDS
THE MASSACHUSETTS STATE BUILDING CODE

TABLE 3605.2.3.1d - continued
DESIGN VALUES FOR DIMENSION LUMBER - VISUAL GRADING

SPECIES AND GRADE	SIZE	NORMAL DURATION	DESIGN VALUE IN BENDING “Fb”		MODULUS OF ELASTICITY “E”	GRADING RULES AGENCY
			Snow Loading	7-Day Loading		
No. 1	2" x 4"	1,510	1,735	1,885	1,000,000	Northern Lumber Manufacturers Association (See Footnotes 1 and 2)
No. 2		1,465	1,685	1,835	900,000	
No. 3		820	940	1,025	800,000	
Stud		820	945	1,030	800,000	
Construction		1,095	1,255	1,365	900,000	
Standard		605	695	755	800,000	
Utility	2”x 6”	290	330	360	800,000	
Select Structural		1,795	2,065	2,245	1,100,000	
No. 1		1,310	1,505	1,635	1,000,000	
No. 2		1,270	1,460	1,590	900,000	
No. 3		710	815	890	800,000	
Stud		750	860	935	800,000	
Select Structural	2” x 8”	1,655	1,905	2,070	1,100,000	
No. 1		1,210	1,390	1,510	1,000,000	
No. 2		1,175	1,350	1,465	900,000	
No. 3		655	755	820	800,000	
Select Structural		1,520	1,745	1,900	1,100,000	
No. 1		1,105	1,275	1,385	1,000,000	
No. 2	2”x 10”	1,075	1,235	1,345	900,000	
No. 3		600	690	750	800,000	
Select Structural		1,380	1,585	1,725	1,100,000	
No. 1	2” x 12”	1,005	1,155	1,260	1,000,000	
No. 2		980	1,125	1,220	900,000	
No. 3		545	630	685	800,000	
YELLOW POPLAR						
Select Structural	2” x 4”	1,725	1,985	2,155	1,500,000	Northern Softwood Lumber Bureau (See Footnotes 1 and 2)
No. 1		1,250	1,440	1,565	1,400,000	
No. 2		1,210	1,390	1,510	1,300,000	
No. 3		690	795	865	1,200,000	
Stud		695	800	870	1,200,000	
Construction		920	1,060	1,150	1,300,000	
Standard	2” x 6”	520	595	645	1,100,000	
Utility		230	265	290	1,100,000	
Select Structural		1,495	1,720	1,870	1,500,000	
No. 1		1,085	1,245	1,355	1,400,000	

TABLE 3605.2.3.1d - continued
DESIGN VALUES FOR DIMENSION LUMBER - VISUAL GRADING

SPECIES AND GRADE	SIZE	NORMAL DURATION	DESIGN VALUE IN BENDING " <i>F_b</i> "		MODULUS OF ELASTICITY " <i>E</i> "	GRADING RULES AGENCY
			Snow Loading	7-Day Loading		
No. 2		1,045	1,205	1,310	1,300,000	
No. 3		600	690	750	1,200,000	
Stud		635	725	790	1,200,000	
Select Structural		1,380	1,585	1,725	1,500,000	
No. 1		1,000	1,150	1,250	1,400,000	
No. 2		965	1,110	1,210	1,300,000	
No. 3	2" x 8"	550	635	690	1,200,000	
Select Structural		1,265	1,455	1,580	1,500,000	
No. 1		915	1,055	1,145	1,400,000	
No. 2		885	1,020	1,105	1,300,000	
No. 3	2" x 10"	505	580	635	1,200,000	
Select Structural		1,150	1,325	1,440	1,500,000	
No. 1		835	960	1,040	1,400,000	
No. 2		805	925	1,005	1,300,000	
No. 3	2" x 12"	460	530	575	1,200,000	

For SI: 1 inch = 25.4 mm, 1 psi = 6.895 kPa.

- When dimension lumber is used where moisture content will exceed 19% for an extended time period, F_b shall be multiplied by 0.85 if F_b exceeds 1,150 psi, and E shall be multiplied by 0.9.
- Following is a list of agencies certified by the American Lumber Standards Committee Board of Review (as of 1991) for inspection and grading of untreated lumber under the rules indicated.

Rules in Writing Agencies

National Lumber Grades Authority (NLGA)
260-1055 W. Hastings Street
Vancouver, BC V6E 2E9
Canada

Northeastern Lumber Manufacturers Association (NELMA)
272 Tuttle Road, P.O. Box 87A
Cumberland Center, Maine 04021

Northern Softwood Lumber Bureau (NSLB)
272 Tuttle Road, P.O. Box 87A
Cumberland Center, Maine 04021

Redwood Inspection Service (RIS)
405 Enfrente Drive, Suite 200,
Novato, California 94949

Southern Pine Inspection Bureau (SPIB)
4709 Scenic Highway,

Rules for which grading is authorized

NLGA

NELMA, NLGA,
WCLIB, WWPA, NLGA

WSLB, WCLIB,
WWPA, NLGA

RIS, WCLIB,
WWPA

SPIB, NELMA,
WCLIB, WWPA, NLGA

780 CMR: STATE BOARD OF BUILDING REGULATIONS AND STANDARDS

THE MASSACHUSETTS STATE BUILDING CODE

Pensacola, Florida 32504

West Coast Lumber Inspection Bureau (WCLIB)
6980 SW Varnes Road, P.O. Box 23145
Portland, Oregon 97223

WCLIB, RIS,
WWPA, NLGA, SPIB

Western Wood Products Association (WWPA)
522 S.W. 5th Avenue
Yeon Building, Portland, OR 97204

WWPA, WCLIB,
NLGA, RIS, SPIB

Non-Rules Writing Agencies

California Lumber Inspection Services
Pacific Lumber Inspection Bureau, Inc.
Timber Products Inspection
Alberta Forest Products Association
Canadian Lumbermen's Association
Cariboo Lumber Manufacturers Association
Central Forest Products Association
Council of Forest Industries of British Columbia
Interior Lumber Manufacturers Association
Macdonald Inspection
Maritime Lumber Bureau
Ontario Lumber Manufacturers Association
Pacific Lumber Inspection Bureau
Quebec Lumber Manufacturers Association

RIS, WCLIB, WWPA, NLGA, SPIB
RIS, WCLIB, WWPA, NLGA
RIS, SPIB, WCLIS, WWPA
NLGA
NLGA, NELMA
NLGA
NLGA
NLGA
NLGA
NLGAS
NLGA, NELMA
NLGA, NELMA
NLGA
NLGA, NELMA

TABLE 3605.2.3.1e
DESIGN VALUES FOR DIMENSION LUMBER - MACHINE STRESS RATED

These “F_b” values are for use where repetitive members are spaced not more than 24 inches. For wider spacing, the “F_b” values should be reduced 13%. Values apply at 19% maximum moisture content in use.

GRADE DESIGNATION	GRADING RULES AGENCY (See Footnotes 1,2,3,4)	SIZE CLASSIFICATION	DESIGN VALUE IN BENDING “F _b ”			MODULUS OF ELASTICITY “E”
			Normal Duration	Snow Loading	7-Day Loading	
900f.1.0 E	3,4		1,050	1,210	1,310	1,000,000
1200f.1.2 E	1,2,3,4		1,400	1,610	1,750	1,200,000
1350f.1.3 E	2,4		1,550	1,780	1,940	1,300,000
1450f.1.3 E	1,3,4		1,650	1,900	2,060	1,300,000
1500f.1.3 E	2		1,750	2,010	2,190	1,300,000
1500f.1.4 E	1,2,3,4		1,750	2,010	2,190	1,400,000
1650f.1.4 E	2		1,900	2,190	2,370	1,400,000
1650f.1.6 E	1,2,3,4		1,900	2,180	2,380	1,500,000
1800f.1.6 E	1,2,3,4		2,050	2,360	2,560	1,600,000
1950f.1.5 E	2		2,250	2,590	2,810	1,500,000
1950f.1.7 E	1,2,4		2,250	2,590	2,810	1,700,000
2100f.1.8 E	1,2,3,4		2,400	2,760	3,000	1,800,000
2250f.1.6 E	2		2,600	2,990	3,250	1,600,000
2250f.1.9 E	1,2,4		2,600	2,990	3,250	1,900,000
2400f.1.7 E	2		2,750	3,160	3,440	1,700,000
2400f.2.0 E	1,2,3,4		2,750	3,160	3,440	2,000,000
2550f.2.1 E	1,2,4	Machine rated lumber 2 X 4 and wider	2,950	3,390	3,690	2,100,000
2700f.2.2 E	1,2,3,4		3,100	3,570	3,880	2,200,000
2850f.2.3 E	2		3,300	3,800	4,130	2,300,000
3000f.2.4 E	1,2		3,450	3,970	4,310	2,400,000
3150f.2.5 E	2		3,600	4,140	4,500	2,500,000
3300f.2.6 E	2		3,800	4,370	4,750	2,600,000
900f.1.0 E	1,2,3		1,050	1,210	1,310	1,000,000
900f.1.2 E	1,2,3		1,050	1,210	1,310	1,200,000
1200f.1.5 E	1,2,3		1,400	1,610	1,750	1,500,000
1350f.1.8 E	1,2		1,550	1,780	1,940	1,800,000
1500f.1.8 E	3	See	1,750	2,010	2,190	1,800,000
1800f.2.1 E	1,2,3	Footnotes	2,050	2,360	2,560	2,100,000

For **SI**: 1 inch = 25.4 mm, 1 psi = 6.895kPa.

Table 3605.2.3.1d footnotes applicable to machine stress rated joists and rafters.

1. National Lumber Grades Authority (see Footnote 2, Table 3605.2.3.1c); Machine Rated Lumber, 2 X 4 and wider.
2. Southern Pine Inspection Bureau; Machine Rated Lumber, 2 X 4 and wider.

THE MASSACHUSETTS STATE BUILDING CODE

3. West Coast Lumber Inspection Bureau; Machine Rated Lumber, 2 X 4 and wider; Machine Rated Joists, 2 X 6 and wider.
4. Western Wood Products Association; Machine Rated Lumber, 2 X 4 and wider.

TABLE 3605.2.3.3a
ALLOWABLE SPAN FOR GIRDERS SUPPORTING ONE FLOOR ONLY

SIZE OF WOOD GIRDER ²		FLOOR LIVE LOAD (psf)	SPACING BETWEEN GIRDERS OR BETWEEN GIRDERS AND LOAD BEARING WALLS ³				
			4 feet	6 feet	8 feet	10 feet	16 feet
4 x 4	-	30	5'6"	4'6"	3'6"	3'0"	2'6"
		40	5'0"	4'0"	3'6"	3'0"	2'6"
4 x 6	-	30	8'0"	6'6"	5'6"	5'0"	4'6"
		40	7'6"	6'0"	5'6"	4'6"	4'0"
4 x 8	6 x 6	30	11'0"	9'0"	8'0"	7'0"	5'6"
		40	10'0"	8'6"	7'6"	6'6"	5'0"
4 x 10	6 x 8	30	14'0"	11'6"	10'0"	8'6"	6'0"
		40	13'0"	10'6"	9'6"	8'6"	5'6"
4 x 12	6 x 10	30	16'6"	14'0"	12'0"	11'0"	9'0"
		40	16'0"	12'6"	11'0"	10'0"	8'0"

For **SI**: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kN/m².

1. Allowable spans may be interpolated between tributary loads shown in table. Spans and girder sizes may be computed independently of the above table in accordance with accepted engineering practice.
2. Spans are based on No. 2 lumber.
3. The spacing is the tributary load to the girder. It is found by adding the spans of the floor structure on each side which are supported by the girder and dividing by 2.

TABLE 3605.2.3.3b
ALLOWABLE SPANS FOR BUILT-UP WOOD CENTER GIRDERS
AND FOOTING SIZES FOR GIRDER SUPPORT COLUMNS

WIDTH OF STRUCTURE (feet)	GIRDER SIZE (inches)	ONE STORY		TWO STORY		THREE STORY	
		Maximum Span (feet-inches)	Footing Size ³ (inches)	Maximum Span (feet-inches)	Footing Size ³ (inches)	Maximum Span (feet-inches)	Footing Size ³ (inches)
24	3-2x8	6-7	17x17*	4-11	20x20	4-1	22x22
	4-2x8	7-8	19x19*	5-8	21x21	4-9	24x24
	3-2x10	8-5	20x20*	6-3	23x23	5-3	25x25
	4-2x10	9-9	21x21	7-3	24x24	6-1	27x27
	3-2x12	10-3	22x22	7-8	25x25	6-4	27x27
	4-2x12	11-10	23x23	8-10	27x27	7-4	29x29
26	3-2x8	6-4	17x17*	4-9	20x20	3-11	22x22
	4-2x8	7-4	18x18*	5-6	22x22	4-7	24x24
	3-2x10	8-1	19x19	6-1	23x23	5-0	25x25
	4-2x10	9-4	21x21	7-0	24x24	5-10	27x27
	3-2x12	9-10	21x21	7-4	25x25	6-1	28x28
	4-2x12	11-5	23x23	8-6	27x27	7-1	30x30
28	3-2x8	6-2	17x17*	4-7	21x21	3-10	23x23
	4-2x8	7-1	18x18*	5-3	22x22	4-5	24x24
	3-2x10	7-10	19x19	5-10	23x23	4-10	26x26

780 CMR: STATE BOARD OF BUILDING REGULATIONS AND STANDARDS

THE MASSACHUSETTS STATE BUILDING CODE

	4-2x10	9-0	20x20	6-9	25x25	5-7	28x28
	3-2x12	9-6	21x21	7-1	26x26	5-11	28x28
	4-2x12	11-0	22x22	8-2	28x28	6-10	30x30
32	3-2x8	5-9	16x16*	4-3	21x21	3-7	24x24
	4-2x8	6-7	17x17	4-11	23x23	4-1	25x25
	3-2x10	7-4	18x18	5-5	24x24	4-6	27x27
	4-2x10	8-5	20x20	6-3	26x26	5-3	28x28
	3-2x12	8-11	20x20	6-8	27x27	5-6	29x29
	4-2x12	10-3	22x22	7-8	29x29	6-4	31x31

For **SI**: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 psf = 0.0479 kN/m², 1 psi = 6.895 kPa.

1. Values shown are for a clear-span trussed roof, a load bearing center wall on the first floor in a two-story construction, and a load-bearing center wall on the first and second floors in three-story construction.
2. Spans based on allowable stress in bending F_b - 1,000 pounds per square inch (psi) for repetitive members. See Table 3605.2.3.1d
3. Footing size based on 2,000 psf soil-bearing capacity; footing thickness shall be one-half (minimum) the width of the footing, or ten inches, whichever is greater.
4. 4x4 posts may be used at these (*) locations, 6x6 posts, or 4x4 posts or three-inch diameter steel columns with bearing plates or equivalent area, are acceptable in all locations.

3605.2.9 Framing of openings: Openings in floor framing shall be framed with double header and trimmer joists, and shall be of sufficient cross section to support the floor joists framing into the header. Approved hangers shall be used for the header-joist to trimmer joist connections when the header joist span exceeds six feet (1829 mm).

3605.2.10 Floor trusses: Wood floor trusses shall be designed in accordance with approved engineering practice. The design of metal plate connected wood trusses shall comply with TPI QST, TPI PCT and TPI-1 "Design Specification for Metal Plate Connected Wood Trusses, *as listed in Appendix A.*" Trusses shall be braced and installed in accordance with their appropriate engineered design. In the absence of specific bracing requirements, trusses shall be braced in accordance with TPI BWT, *as listed in Appendix A.* Truss members shall not be drilled, cut, notched or altered in any manner unless so designed.

3605.2.11 Draftstopping required: When there is usable space above and below the concealed space of a floor/ceiling assembly, draftstops shall be installed so that the area of the concealed space does not exceed 1,000 square feet (93 m²). Draftstopping shall divide the concealed space into approximately equal areas. Draftstopping shall be provided in floor/ceiling assemblies under the following certain circumstances:

1. Ceiling is suspended under the floor framing; or
2. Floor framing is constructed of truss-type open-web or perforated members.
3. The assembly is enclosed by a floor membrane above and a ceiling membrane below.

3605.2.11.1 Materials: Draftstopping materials shall not be less than ½-inch (12.7 mm) gypsum board, ¾-inch (9.5 mm) wood structural panels, ¾-inch (9.5 mm) Type 2-M-W particleboard or other approved materials adequately supported. Draftstopping shall be installed parallel to the floor framing members unless otherwise approved by

the building official. The integrity of all draftstops shall be maintained.

780 CMR 3605.3 FLOOR SHEATHING

3605.3.1 Lumber sheathing: Maximum allowable spans for lumber used as floor sheathing shall conform to Tables *3605.3.1*, *3605.3.2.1.1a* and *3605.3.2.1.1b*.

3605.3.1.1 End joints. Lumber used as subflooring *shall be installed with end joints* over supports unless end-matched lumber is used, in which case each piece shall bear on at least two joists. Subflooring may be omitted when joist spacing does not exceed 16 inches (406 mm) and a one-inch (25 mm) nominal tongue-and-groove wood strip flooring is applied perpendicular to the joists.

TABLE 3605.3.1 MINIMUM THICKNESS OF LUMBER FLOOR SHEATHING

JOIST OR BEAM SPACING (inches)	MINIMUM NET THICKNESS	
	Perpendicular to Joist	Diagonal to Joist
24	1 1/16	¾
16	?	?
48 ¹	1½ T&G	N/A
54 ²		
60 ³		

For SI: 1 inch = 25.4 mm, 1 psi = 6.895 kPa.

1. Minimum 840 F_b 1,000,000 E .
2. Minimum 950 F_b 1,300,000 E .
3. Minimum 1,060 F_b 1,600,000 E .

3605.3.2 Plywood sheathing:

3605.3.2.1 Identification and grade: Plywood used for structural purposes shall conform to DOC PS 1, DOC PS 2 and HPMA (ANSI) HP, *as listed in Appendix A*, and wood structural panels shall conform to DOC PS 2, *as listed in Appendix A*. All panels shall be identified by a grade mark of

THE MASSACHUSETTS STATE BUILDING CODE

certificate of inspection issued by an approved agency.

3605.3.2.1.1 Subfloor and combined subfloor underlayment: Where used as subflooring or combination subfloor underlayment, wood structural panels shall be of one of the grades specified in Table *3605.3.2.1.1a*. When sanded plywood is used as a combination subfloor underlayment, the grade shall be as specified in Table *3605.3.2.1.1b*.

3605.3.2.1.2 Wood structural panels: Wood structural-use panels conforming to DOC PS 2 includes performance-rated plywood, oriented strand-board and composite panels. Oriented strand-board structural-use panels manufactured in Canada shall conform to CSA 0437, *as listed in Appendix A*.

3605.3.2.2 Allowable spans: The maximum allowable span for wood structural panels used as subfloor or combination subfloor underlayment shall be as set forth in Table *3605.3.2.1.1a*. The maximum span for sanded plywood combination subfloor underlayment shall be set forth in Table *3605.3.2.1.1b*.

3605.3.2.3 Installation: Plywood and wood structural panels used as subfloor or combination

subfloor underlayment shall be attached to framing in accordance with Table 3606.2.3a.

3605.3.3 Particleboard:

3605.3.3.1 Identification and grade: Particleboard shall conform to ANSI A208.1, *as listed in Appendix A*, and shall be so identified by a grade mark or certificate of inspection issued by an approved agency.

3605.3.3.2 Floor underlayment: Particleboard floor underlayment shall conform to Type PBU, *as listed in Appendix A*, and shall not be less than 1/4-inch (6.4 mm) in thickness.

3605.3.3.3 Installation: Particleboard underlayment shall be installed in accordance with the recommendations of the manufacturer and attached to framing in accordance with Table 3606.2.3a.

TABLE 3605.3.2.1.1a
ALLOWABLE SPANS AND LOADS FOR PLYWOOD AND WOOD STRUCTURAL PANELS
FOR ROOF AND SUBFLOOR SHEATHING AND COMBINATION SUBFLOOR

UNDERLAYMENTS^{1,2,3}

SPAN RATING	NOMINAL PANEL THICKNESS (inch)	MAXIMUM SPAN (inches) ⁴		LOAD (pounds per square foot, at maximum span)		MAXIMUM SPAN (inches)
		With Edge Support	Without Edge Support	Total Load	Live Load	
C-D, C-C, SHEATHING ⁵		ROOF ⁶				SUBFLOOR ⁶
12/0	⁵ / ₁₆	12	12	40	30	0
16/0	⁵ / ₁₆ , ?	16	16	40	30	0
20/0	⁵ / ₁₆ , ?	20	20	40	30	0
24/0	?, ⁷ / ₁₆ , ½	24	20 ⁷	40	30	0
24/16	⁷ / ₁₆ , ½	24	24	50	40	16
32/16	¹⁵ / ₃₂ , ½, ?	32	28	40	30	16 ⁸
40/20	¹⁹ / ₃₂ , ?, ¾, ?	40	32	40	30	20 ^{8,9}
48/24	²³ / ₃₂ , ¾, ?	48	36	45	35	24
UNDERLAYMENT, C-C PLUGGED SINGLE FLOOR ¹⁰		COMBINATION SUBFLOOR ROOF ⁶				UNDERLAYMENT ¹¹
16 o.c.	¹⁹ / ₃₂ , ?	24	24	50	40	16 ⁸
20 o.c.	¹⁹ / ₃₂ , ?, ¾	32	32	40	30	20 ^{8,9}
24 o.c.	²³ / ₃₂ , ¾	48	36	35	25	24
32 o.c.	?, 1	48	40	50	40	32
48 o.c.	1 ³ / ₃₂ , 1?	60	48	50	40	48

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479kNm²

THE MASSACHUSETTS STATE BUILDING CODE

1. The allowable loads were determined using a dead load of 10 psf. If the dead load exceeds 10 psf, then the live load shall be reduced accordingly.
2. Panels continuous over two or more spans with long dimension perpendicular to supports. Spans shall be limited to values shown because of possible effect of concentrated loads.
3. Applies to panels 24 inches or wider.
4. Lumber blocking, panel edge clips (one midway between each support, except two equally spaced between supports when span is 48 inches), tongue-and-groove panel edges, or other approved type of edge support.
5. Includes Structural 1 panels in these grades.
6. Uniform load deflection limitation; $\frac{1}{180}$ of span under live load plus dead load, $\frac{1}{240}$ of span under live load only.
7. Maximum span 24 inches for $\frac{1}{2}$ -inch panels.
8. Maximum span 24 inches where $\frac{3}{4}$ -inch wood finish flooring is installed at right angles to joists.
9. Maximum span 24 inches where $1\frac{1}{2}$ inches of lightweight concrete or approved cellular concrete is placed over the subfloor.
10. Unsupported edges shall have tongue-and-groove joints or shall be supported with blocking unless nominal $\frac{1}{4}$ -inch thick underlayment or $1\frac{1}{2}$ inches of light-weight concrete or approved cellular concrete is placed over the subfloor, or $\frac{3}{4}$ -inch wood finish is used. Allowable uniform live load at maximum span, based on deflection of $\frac{1}{360}$ of span, is 100 psf.
11. Unsupported edges shall have tongue-and-groove joints or shall be supported with blocking unless nominal $\frac{1}{4}$ -inch thick underlayment or $\frac{3}{4}$ -inch wood finish flooring is used. Allowable uniform live load at maximum span, based on deflection of $\frac{1}{360}$ of span, is 100 psf, except panels with a Span Rating of 48 o.c. are limited to 65 psf total uniform load at maximum span.

TABLE 3605.3.2.1.1b
ALLOWABLE SPANS FOR PLYWOOD
COMBINATION SUBFLOOR
UNDERLAYMENT¹

IDENTIFICATION	SPACING OF JOISTS		
	16	20	24
Species Group ²			
1	1/2	?	3/4
2,3	?	3/4	?
4	3/4	?	1

For SI: 1 inch = 25.4 mm, 1psf = 0.0479 kNm²

1. Plywood continuous over two or more spans and face grain perpendicular to supports. Unsupported edges shall be tongue-and-groove or blocked except where nominal 1/4-inch-thick underlayment or 3/4-inch wood finish floor is used. Allowable uniform live load at maximum span based on deflection of $\frac{1}{360}$ of span is 100 psf.

2. Applicable to all grades of sanded Exterior-type plywood.

780 CMR 3605.4 TREATED-WOOD FLOORS

(ON GROUND)

3605.4.1 General: Treated-wood basement floors and floors on ground shall be designed to withstand axial forces and bending moments resulting from lateral soil pressures at the base of the exterior walls and floor live and dead loads. Floor framing shall be designed to meet joist deflection requirements in accordance with **780 CMR 3603.1**.

3605.4.1.1 Unbalanced soil loads: Unless special provision is made to resist sliding caused by unbalanced lateral soil loads, wood basement floors shall be limited to applications where the differential depth of fill on opposite exterior foundation walls is two feet (610 mm) or less.

3605.4.1.2 Construction: Joists in wood basement floors shall bear tightly against the narrow face of studs in the foundation wall or

directly against a band joist which bears on the studs. Plywood subfloor shall be continuous over lapped joists or over butt joints between in-line joists. Sufficient blocking shall be provided between joists to transfer lateral forces at the base of the end walls into the floor system.

3605.4.1.3 Uplift and buckling: Where required, resistance to uplift or restraint against buckling shall be provided by interior bearing walls or properly designed stub walls anchored in the supporting soil below.

3605.4.2 Site preparation: The area within the foundation walls shall have all vegetation, topsoil and foreign material removed, and any fill material which is added shall be free of vegetation and foreign material. The fill shall be compacted to assure uniform support of the treated-wood floor sleepers.

3605.4.2.1 Base: A minimum four-inch-thick (102 mm) granular base of gravel having a maximum size of 3/4 inch (19 mm) or crushed stone having a maximum size of 1/2 inch (12.7 mm) shall be placed over the compacted sub-grade.

3605.4.2.2 Moisture barrier: Polyethylene sheeting of minimum six-mil (0.15 mm) thickness shall be placed over the granular base. Joints shall be lapped six inches (153 mm) and left unsealed. The polyethylene membrane shall be placed over the treated-wood sleepers and shall not extend beneath the footing plates of the exterior walls.

3605.4.3 Materials: All framing materials, including sleepers, joists, blocking and plywood subflooring, shall be pressure preservatively treated and dried after treatment in accordance with AWPAC22, *as listed in Appendix A*.

780 CMR 3605.5 CONCRETE FLOORS

(ON GRADE)

3605.5.1 General: Concrete slab-on-grade floors shall be constructed in accordance with Figure

THE MASSACHUSETTS STATE BUILDING CODE

3604.3.1a. The specified compressive strength of concrete at 28 days shall not be less than 2,500 pounds per square inch (17,225 kPa), except where weather exposure requires greater strength and air-entrained concrete, as set forth in Table 3604.2.2 and 780 CMR 3604.2.2.

Slabs shall be constructed with control joints having a depth of at least $\frac{1}{4}$ the slab thickness but not less than one inch, and joints shall be spaced at intervals not more than 30 feet in each direction and slabs not rectangular in shape shall have control joints across the slab at points of offset, if offset exceeds ten feet.

Exception: Control joints are not required or may exceed 30 foot intervals where welded wire fabric or equivalent is provided in accordance with Table 3605.5.1. The welded wire fabric or

1. Values in table are based on reinforcement with a yield strength of 65,000 psi. If reinforcement with a different yield strength is used, the slab dimension shown in the table shall be adjusted by multiplying by the yield strength of the steel to be used and dividing by 65,000.

2. Welded wire fabric.

3605.5.2 Site preparation: The area within the foundation walls shall *be cleaned of all* vegetation and organic and foreign material and top soil.

3605.5.2.1 Fill: Fill material shall be free of vegetation and foreign material. The fill shall be compacted to assure uniform support of the slab, and except where approved, the fill depths shall not exceed 24 inches (610 mm) for clean sand or gravel.

3605.5.2.2 Base: A four-inch-thick (102 mm) base course consisting of clean graded sand, gravel, crushed stone or crushed blast-furnace slag passing a two-inch (51 mm) sieve shall be placed on the prepared subgrade when the slab is below grade.

Exceptions: A base course is not required when the concrete slab is installed on well-

equivalent material shall be placed at mid-depth of the slab or two inches from the top surface for slabs more than four inches in thickness.

**Table 3605.5.1
CRACK CONTROL REINFORCEMENT
FOR SLABS**

MAXIMUM DIMENSION OF SLAB OR DISTANCE BETWEEN CONTROL JOINTS (Feet) ¹						WWF ² WIRE SPACING (inches)	WWF ² WIRE SIZE DESIGNATION
SLAB THICKNESS (inches)							
3.5	4.0	4.5	5.0	5.5	6.0		
42	36	32	29	26	24	6x6	W1.4xW1.4
59	52	46	42	38	35	6x6	W2.0xW2.0
86	75	67	60	55	50	6x6	W2.9xW2.9

drained or sand-gravel mixture soils according to the United Soil Classification System, Group I Soils.

3605.5.2.3 Vapor barrier: An approved vapor barrier with joints lapped not less than six inches (153 mm) shall be placed between the concrete floor slab and the base course or the prepared subgrade where no base course exists.

Exception: The vapor barrier may be omitted:

1. From detached garages, utility buildings and other unheated accessory structures;
2. From driveways, walks, patios and other flatwork not likely to be enclosed and heated at a later date; or
3. Where approved by the building official, based on local site conditions.

780 CMR 3605.6 METAL

3605.6.1 General: Steel and aluminum elements shall be constructed of materials and designed in accordance with the AISC "Specification for the Design, Fabrication and Erection of Structural Steel Buildings" and AA SAS30, respectively, as listed in Appendix A. Steel elements may be hot-

rolled or cold-formed structural steel. Members significantly affect their structural performance.
shall be straight and free of any defects which would